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Preliminary Feasibility of Resource Recovery for City of Rome and Floyd County, Georgia

CSI Resource Systems, Inc.
Boston, MA

Prepared for

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A TECHNICAL ASSISTANCE PROGRAM REPORT

PRELIMINARY FEASIBILITY OF RESOURCE RECOVERY FOR CITY OF ROME AND FLOYD COUNTY, GEORGIA

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RESOURCE RECOVERY AND CONSERVATION PANELS

SEC. 2003. The Administrator shall provide teams of personnel, including Federal, State, and local employees or contractors (hereinafter referred to as "Resource Conservation and Recovery Panels") to provide States and local governments upon request with technical assistance on solid waste management, resource recovery, and resource conservation. Such teams shall include technical, marketing, financial, and institutional specialists, and the services of such teams shall be provided without charge to States or local governments.

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PRELIMINARY FEASIBILITY
OF
RESOURCE RECOVERY FOR
CITY OF ROME AND FLOYD COUNTY, GEORGIA

PREPARED FOR

OFFICE OF SOLID WASTE MANAGEMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV, ATLANTA, GEORGIA

BY

CSI RESOURCE SYSTEMS, INC.
BOSTON, MASSACHUSETTS

JUNE 1979

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PREFACE

The report was prepared for the City of Rome and Floyd County, Georgia under the U.S. Environmental Protection Agency's Technical Assistance Program to state and local governments interested in implementing resource recovery. The report was prepared as a result of a request to the U.S. EPA Region IV from the Rome-Floyd County Planning Commission, supported by the City and County Commissioners and the Georgia Kraft Company. The request also was supported by the Georgia Department of Natural Resources. This report contains the results of several site visits to Floyd County by CSI Resource Systems, Inc., as well as the results of special weigh programs conducted by City and County personnel in response to a request by Resource Systems. Resource Systems is a technical assistance contractor to the Office of Solid and Hazardous Waste, U.S. EPA Region IV. Under the terms of the Technical Assistance Programs, the entire cost of Resource Systems' technical assistance activities on behalf of the City of Rome and Floyd County was paid for by the U.S. EPA.

The report presents the results of a preliminary determination of the feasibility of energy and materials recovery. Such determination involved development of estimates of waste quantity generated within Floyd County and a preliminary definition of its composition; evaluation of the market potential for energy and materials recovery; development and assessment of alternative solid waste management options; and examination of the legal and institutional aspects of resource recovery implementation.

Several months subsequent to the initiation of technical assistance work by Resource Systems, the City and County jointly submitted a preapplication to the U.S. EPA for implementation planning funds under the President's Urban Policy Program. In late February 1979, Rome-Floyd County were notified that they had been selected to negotiate a cooperative agreement with U.S. EPA Region IV under this new program. It is believed that the results of the technical assistance activity should essentially satisfy the technical study requirements for Phase I activities under the Urban Policy Program, and, thus, enable the City and County to determine whether to proceed with implementation of a resource recovery project prior to entering into a cooperative agreement for the conduct of Phase II activities.

This report could not have been prepared without the generous cooperation of personnel from the City of Rome, Floyd County, Georgia Kraft Company and the Georgia Department of Natural Resources. Resource Systems wishes to thank especially the following individuals for their support:

Max Hipp - City of Rome
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James Dixon - Rome-Floyd County Planning Commission
Duke Hicks - Georgia Kraft Company
Claude Goodley - Georgia Department of Natural Resources

I. SUMMARY

A. Waste Characterization

The first step towards proposing economically viable methods of managing solid waste is determination of the amount of processable waste present in the City and County. To accomplish this, 2-week weigh programs were carried out by the City and County at their landfills to determine representative bulk densities which were used to extend the existing disposal volume records to realistic weight estimates. This information provided the basis for converting existing landfill data, reported as cubic yards (yd^3)/day disposed, into a total average disposal rate of 210 TPD_7, or $(tons/day)_7$. It was found that waste generation in Floyd County is split approximately evenly between the City and remainder of the County. All non-processable waste was excluded from this analysis. Brush, construction debris, and carpet trimming are considered non-processable because they cannot be routinely processed in facilities producing either RDF or steam without causing extraordinary maintnenance expenses and downtime.

Since a detailed analysis of waste composition is not justified for a prefeasibility analysis when regional data are available, the waste composition of Floyd County was assumed to be the same as that of DeKalb County, Georgia. The only change made to the DeKalb composition was to reduce the aluminum concentration from 1% to 0.5% due to the unusually low concentration of this material observed in Floyd County solid waste. The heating value of Rome-Floyd County waste was calculated to be about 5,000 Btu/lb.

B. Market Potential

The investigation into markets for recovered materials and energy was conducted to determine market feasibility and the interest among potential buyers; it was not the intent to establish firm purchasing commitments as part of the market investigation.

1. Materials Recovery Potential--The possible markets for recovered materials surveyed were magnetic scrap, aluminum/non-magnetic scrap, glass, and paper. The results of the evaluation reveal that these materials would not be a viable source of revenue for capital-intensive resource recovery

for a number of reasons: First, recovered magnetic scrap would be predominantly tin-coated food and drink cans, for which no local market exists. It would not be economically feasible to sell directly to a detinner--the closest one being located in Tampa, Florida--because the transportation costs would be prohibitive. Second, while aluminum/non-magnetic scrap does generate buyer interest, the following elements contribute to making its recovery economically unattractive: existence of aluminum recycling activities by Reynolds, Alcoa, and North Georgia Distributors, which generate an estimated 12 tons per month (about 28 percent of the estimated aluminum in the waste stream), and the low recovery efficiencies and high capital costs of aluminum/non-magnetic recovery equipment. Third, although glass cullet is actively sought by Atlanta-based glass manufacturers, their specifications for acceptable cullet are very stringent and only could be met with rigorous glass recovery techniques. However, the capital intensiveness of glass recovery systems contributes to their overall economics being generally unfavorable at waste tonnages less than 1,000 TPD. Fourth, since paper--in the form of newsprint and cardboard--is currently being extensively reclaimed in Floyd County through the action of a number of public and private agencies, paper recovery at a recovery facility would compete with existing private enterprise and publicly sponsored programs.

2. Energy Recovery Potential--Energy market investigations were conducted for both steam and solid fuel. While some interest in purchasing process steam was expressed by an industrial steam user, siting a small waste heat recovery combustion facility within practical steam distribution distance appears to present significant difficulties. Despite the siting problem, further investigation of a steam market is warranted because of the highly favorable economics of such a system. Solid fuel, however, can probably be utilized by Georgia Kraft in its two existing coal/oil/bark-fired boilers. The existing bark-firing equipment can probably be utilized to fire refuse-derived fuel as it is delivered to the plant from a centrally located fuel processing facility. Sufficient space is available for locating a fuel receiving system on the perimeter of its site.

Based upon existing equipment capacities, Georgia Kraft has a current deficit of 300 tons of bark per day between their in-house bark supply and existing boiler capacity, which is currently filled through the purchase of bark. Thus, it appears that Georgia Kraft is limited to accepting less than 300 tons per day of a bark-equivalent fuel. This capacity is consistent with the tonnage of processable waste generated within the County. If more refuse-derived fuel were economically available, a third coal/oil/gas boiler could be converted by Georgia Kraft for bark burning. As a result, it appears that any refuse-derived fuel (RDF) sold to Georgia Kraft would be competing with purchased bark and not coal as long as only two boilers are fired with bark. However, if a third boiler were converted, then coal might be the offset fuel. Determination of the value of RDF is a subject for negotiation with the company, especially since the supply of purchased bark available to Georgia Kraft may decline as competing demands arise for its use as a fuel, and/or the price may increase substantially as a result of increased demand.

C. Solid Waste Management Options

Based upon the determination of the amount of processable solid waste in the Rome-Floyd area and the marketability of recovered material and energy products, several disposal options were hypothesized and evaluated: fluff RDF production, steam production, and a third sanitary landfill. The remaining lives of the existing County and City landfills are 7 and 10 years respectively. Since it will be about 5 years before a resource recovery facility of any kind could be on-stream, it is important that these options be evaluated promptly and a decision made concerning the direction of future solid waste management in Floyd County.

1. RDF Production Facility--Processable solid wastes generated in Rome-Floyd County would be received on a covered concrete slab at the contemplated fluff RDF production facility. A primary rotary screen is used to remove glass, dirt, and wet garbage from the bulk of the processable solid waste; a shredder for size reduction of the "cleaned" waste; magnets for separation and recovery of magnetic scrap; and a final screen as part of the mill circuit for size control of the prepared fuel. Assuming Georgia Kraft is the eventual fuel buyer, RDF would be transported from the production facility by transfer trailers to Georgia Kraft, where the RDF would be pneumatically conveyed to the existing bark storage bins on each boiler. RDF would be

consumed as rapidly as it was off-loaded. No RDF storage is planned.

The 1984 net disposal cost for the RDF facility and residual and non-processable waste landfill operations is estimated to range from a high of $17.60 per ton to a low of $10.40 per ton of total waste generated within the County. The range in net dipsosal costs is affected by price of RDF, which can be negotiated. The high and low costs reflect the extremes in pricing: the high cost based upon today's bark price escalated, and the low cost based upon today's coal price escalated. If only a low price for RDF can be negotiated, it does not appear that Rome-Floyd County should implement an RDF project.

2. Steam Production Facility--The second energy recovery option investigated was the production of process steam. (As previously noted, siting of a steam production facility appears to offer significant difficulties.) Based upon the estimated processable daily tonnage and seasonal fluctuations, the system involves six 50 TPD modular starved air combustion units with waste heat recovery to produce steam. In this sytem, solid waste is substoichiometrically combusted in the primary chamber of each unit. A secondary chamber acts as a low-Btu gas burner by burning to completion the products of pyrolysis and partial combustion. The hot gases leaving the secondary chamber pass through a waste heat boiler in order to recover heat for process steam production.

The 1984 net disposal cost for a steam generating facility and residual and non-processable waste landfill operations is estimated to range from a high of $8.30 per ton to a low of $7.10 per ton of total waste generated within the County. The range in net disposal cost is affected by the price negotiated for steam per 1000 pounds. It has been assumed that the steam buyer is using No. 6 residual oil and that the price for steam would not be discounted because the buyer would in effect have a "captive" energy source, thus eliminating uncertainties associated with the availability of supply of oil. The range in steam price, hence revenues and net disposal cost, reflects current differences in price for 2.2 percent sulfur content oil and 1.1 percent sulfur oil.

3. New Sanitary Landfill--The final solid waste management option examined was the opening of a new sanitary landfill in the County. Two

alternatives were examined. First, the City and County would cooperatively develop and operate a new sanitary landfill. Second, the City and County would independently develop and operate new sanitary landfills. All new landfill options take into account the incremental capital and operating costs associated with meeting the proposed EPA Landfill Guidelines. While the current political climate within the County does not appear to support dependence upon sanitary landfilling as a management solution, it must be recognized that even with significant volume reduction achieved through resource recovery a sanitary landfill will be required for disposal of non-processable solid wastes and residues produced by a recovery facility. At best, undertaking a resource recovery project would delay for a few more years the need to find a new landfill site, since it is doubtful that either of the existing landfills could meet the proposed EPA Landfill Guidelines without considerable additional capital outlays and operating expense. Such cost probably would not be justified, given the limited useful life of these facilities. However, any delay in site selection and acquisition could result in suitable landfill sites of sufficient acreage being preempted by development.

The first alternative (development of and operation of a single new sanitary landfill by the City and County on a cooperative basis) offers the the lowest cost solid waste management opportunity of all the options examined. The annual disposal cost for a single new landfill, including incremental capital and operating costs associated with meeting proposed EPA Landfill Guidelines, is estimated to be $13.00 per ton in 1984.

Under the second alternative (the City and County independently developing and operating their own sanitary landfills) the combined cost of disposal is estimated in 1984 to amount to somewhat less than $20.20 per ton. This alternative clearly is a more expensive solution than a cooperatively operated new landfill and would compound the difficulties associated with the siting of such a disposal facility.

4. Summary of Options--The results of the examination of the solid waste options available to the City of Rome and Floyd County are summarized in the following table:

TABLE 1.1

SUMMARY OF SOLID WASTE MANAGEMENT OPTIONS
(1984 Dollars)

	Resource Recovery		New Sanitary Landfill		
	RDF	Steam	Joint	County	City
Total Solid Waste TPY, 1984	97,954	97,954	97,954	63,166	34,788
Processable Waste TPY, 1984	74,874	74,874	NA	NA	NA
Capital Cost ($000)	$8,382	$11,383	$3,455	$2,916	$2,213
Annual Facility Cost ($000)	$2,330	$ 2,468	NA	NA	NA
Landfill Annual Cost ($000)	$ 647	$ 696	$1,271	$1,097	$ 877
Less: Energy Revenues ($000)	$590-$1,296	$1,754-$1,962	NA	NA	NA
Less: Landfill Savings Credit ($000)	$ 641	$ 592	NA	NA	NA
Net Disposal Cost ($000)	$1,725-1,020	$814-$696	$1,271	$1,097	$ 877
Net Disposal Cost per Ton	$17.60-$10.40	$8.30-$7.10	$13.00	$17.40	$25.00

Note: See Appendix B for detailed cost estimates and assumptions.

Inspection of Table 1.1 reveals that a landfill credit has been assigned to both resource recovery options. The concept of a landfill credit was utilized to account for two factors. First, annual costs of sanitary landfill operations will be lower than for either of the new sanitary landfill options due to a 50-percent or more reduction in the tonnage and volume of solid waste to be disposed. Second, it is assumed that for either resource recovery option the facility will be privately operated (but publicly owned), and as such will pay a charge for disposal of residues generated by the facility as part of annual operating costs. Payment of the disposal charge represents a revenue source for the landfill operation, thus reducing the overall annual net cost of that facility.

Implementation of an RDF project appears viable only if the price received for RDF is significantly higher than the escalated current price of bark, adjusted for the higher heating value of RDF. Alternatively, if the City and County decide not to undertake joint development and operation of a new sanitary landfill, then implementation of an RDF project, even under the worst revenue situation, is a highly feasible course of action. Because the feasibility of an RDF project is highly sensitive to the price received for RDF, immediate, in-depth discussions and negotiations with Georgia Kraft are key to determining the viability of this option.

From an economic point of view, implementation of a project for the production of process steam would be the most preferred option, if there is real interest expressed by a viable steam customer. System disposal costs include all annual costs (debt service, O & M, and replacement sinking funds) for both the recovery facility and development and operation of a new sanitary landfill meeting EPA's siting criteria and proposed design and operating guidelines (EPA Landfill Guidelines). It should be noted that, on the one hand, steam revenues could be somewhat higher than estimated if the price the buyer was willing to pay were based upon the buyer's cost of steam production rather than on fuel, as assumed in this analysis. On the other hand, steam revenues could be somewhat lower than estimated if a buyer were unable to utilize all of the steam which could be generated by a recovery facility. Even in this case, it appears that a steam project would remain the best economic option. For example, if a buyer purchased only 75 percent of the steam which could be produced, the estimated 1984 net disposal cost would range from a high of $12.80 per ton to a low of $12.10 per ton. Although there appear to be siting problems associated with a steam project, further in-depth investigation as to its feasibility is warranted because of the favorable economics. Such investigation also is warranted because of the uncertainties associated with reaching a reasonable pricing formula and other terms and conditions with Georgia Kraft.

In the event neither resource recovery option turns out to be feasible, then joint City-County acquisition,development, and operation of a new sanitary landfill would be the preferred course of action. In practical terms, a new site capable of meeting EPA landfill siting criteria and its proposed design and operating guidelines will be required even if a resource recovery project is undertaken. However, the acreage requirements for a sanitary landfill capable of handling solid wastes generated within the County over a 20-year period would be substantially less than would be required in the absence of resource recovery.

A decision on the disposal option should be made quickly. The County, which must take the lead in such a decision because of its rapidly depleting landfill space, must know whether the City is an active, co-equal partner or not. The City's active involvement and commitment to participate is essential to the County, whether the decision be landfill or energy recovery. In the latter case, no viable project is possible unless the City is an active, co-equal participant. With respect to the landfill option, the County needs to know the volume to be disposed in order to determine the acreage and best site location.

Although it is estimated that the City's landfill has significantly more remaining years of useful life than the County's landfill, the City in reality faces the same need to make an early decision on a disposal option as the County, for two reasons. First, because the City's existing landfill is located on top of a limestone formation, the groundwater of which flows into the major water supply for the area, it will not meet EPA criteria for a sanitary landfill. As a result, it is highly probable that within the next 5 years the City will have to incur substantial expense to upgrade the present facility to a sanitary landfill. At a minimum, opening new working sections of the existing landfill may entail: an impermeable liner; vertical barriers to control methane gas migration; impermeable cover; diking and ponding to control surface runoff; leachate collection, treatment, and monitoring wells; and methane gas monitoring wells. Depending upon the results of specific site analysis, it may also be necessary to extend leachate collection and treatment systems and methane gas migration controls into the presently used-up sections of the landfill, as well as to provide additional surface runoff control. Some new equipment also may be required in order to obtain greater compaction of the solid waste disposed in new working sections. Thus, the City faces the prospect of substantial capital outlays and increased operating costs for a facility with a relatively short time horizon of continued usefulness.

Second, the longer estimated useful life of the City's landfill compared to that of the County is due in significant measure to the fact that all of the industrial solid waste generated within Rome is not disposed of at the City's landfill, but rather at the County's Berry Hill Road landfill. As a result, the County is supplying a valuable service to the City, with the result that the City's landfill has a greater capacity than otherwise would be the case.

Given the above two factors plus the need of the County to find an alternative to continued use of a non-conforming landfill and limited useful remaining life, the City in a very real sense faces the same urgency as the County in deciding upon the best solid waste disposal option. As a result, it would appear to be in the City's best interest that it become an active partner with the County in deciding upon a future course of action for the disposal of solid waste.

When the disposal options are viewed from a system perspective (wherein haul cost from the end of collection routes and the location of the County's 70-cubic-yard containers are taken into account), it appears that energy recovery (including the worst revenue case for an RDF facility) is a better option than continued total reliance upon landfilling as a disposal method, especially where an energy facility can be reasonably centrally located--which should be possible, given the significant vacant acreage zoned for industry in south, central Rome. Transportation cost considerations, thus, appear to reinforce a joint approach to solid waste disposal within Floyd County.

D. Legal/Institutional Considerations

Waste control, procurement, and marketing have been identified as the three critical aspects of resource recovery which require a legal and institutional framework designed to permit efficient and effective project implementation. Code Chapter 69-15a, passed by the Georgia Legislature in 1978, establishes Resource Recovery Development Authorities which have maximum flexibility in the method used to acquire a recovery system and market recovered products; are empowered to enter into long-term contracts (up to 50 years) with both public and private entities; and can serve as a financing vehicle through the use of revenue bonds which would not involve the full-faith and credit of the City or County. Revenue bond financing has an advantage over other forms of public financing in that it forces rigorous analysis to determine that a project is economically feasible. It is suggested that the City and County jointly activate such an authority if they decide to proceed with a full-scale feasibility effort.

While an authority has a number of important advantages over City or County sponsorship of a project, there are a number of issues which must be resolved prior to its activation. One of the most important of these issues is how to provide a newly created Authority with operating funds, since such an Authority under statute has no taxing or similar powers for raising operating revenues. One approach would be to designate the Authority as the implementing agency for Phase II activities under the Urban Policy Program, and, thus, have it enter into the cooperative agreement with U.S. EPA Region IV. In this way the Authority would be the grant recipient and have funds available for establishing a staff. Local matching funds could be provided through in-kind services from the County and City. While a number of suggestions are offered with respect to operating funds, it is concluded that a satisfactory solution will require considerable cooperation and ingenuity on the part of the County and City.

Because individuals and private haulers (especially the latter) collect and dispose of most of the solid waste generated in the Rome-Floyd County area, it is recommended that more explicit control over private haulers be instituted. While the City's waste disposal ordinance appears to provide sufficient power to the City to direct where private haulers could dispose of the commercial and industrial wastes they collected, several modifications are suggested in order to eliminate any potential legal issues. For both the County (through a new ordinance) and the City it is recommended that private haulers essentially become collection agents of the two governments. The status of "agent" would eliminate any potential legal issue and provide the County and City with the power necessary to confidently enter into put-or-pay type contracts for delivery of waste with the Authority, in order to permit financing of a plant by effectively guaranteeing minimum revenues to the resource recovery facility.

II. WASTE CHARACTERIZATION

The choice of alternative disposal techniques and their respective economics is dependent upon the quantity and composition of solid waste, and, in the case of resource recovery, on the presence of likely buyers of recovered energy and/or materials. At the time this study was undertaken the only data available on the quantity of solid waste generated within Floyd County were daily, monthly and annual records of cubic yards of solid waste disposed of at the City and the County landfills. Cubic yard data are classified by source, e.g., city collection, County 30 CY box, individuals, independent haulers of commercial and industrial solid waste, and brush and trash.

A. Waste Quantity and Composition

1. Waste Quantity--To determine the tonnage generated, it was necessary to develop reliable local estimates of bulk density (pound per cubic yard) for waste delivered to both the City and the County landfills. Recognizing that different sources and trucks might have different bulk densities, each category on the landfill record sheet was analyzed separately. Not all solid waste is processable at a recovery facility. Therefore, it was necessary to segregate the solid waste into two streams, processable and non-processable. The focus of developing tonnage estimates was on processable solid waste; therefore, all brush construction debris, etc. was excluded from consideration. Three steps were undertaken to develop approximate processable tonnages at both the City and County landfills. The results of the three-step process for each landfill were aggregated to produce County-wide tonnage estimates. The three steps involved: a) determining the bulk density of each segment of the waste stream based upon the actual weighing of a sample of collection vehicle by type of waste (residential, commercial, industrial) and establishing a median value for the bulk density of each type of waste; b) analyzing historical data on cubic yards for each type of processable waste to establish an average-month cubic-yard estimate; and c) converting average monthly cubic-yard data into average tons per day for each processable waste category

by multiplying the median bulk density values by the monthly cubic-yard estimate for each waste category and dividing by the days in a month.

As a result of this three-step estimating procedure, it is estimated that the average daily total processable tonnage disposed of within Floyd County amounts to 210 tons per day seven. Of this average daily* tonnage, 100 TPD$_7$ are disposed of at the City's landfill and 110 TPD$_7$ are disposed of at the County's landfill. Considerable variation exists around these average daily tonnages. For example, at the City landfill, daily tonnages range from a low of approximately 80 TPD$_7$ to a high of 110 TPD$_7$ Such variation must be taken into account when determining the daily throughput capacity of a resource recovery system. For the interested reader a more detailed description of each analytical step is provided in the following subsections:

a. Determination of average bulk density for each segment of wastestream--The first step in the conversion of yd^3/day to tons/day is the calculation of an average bulk density (lb/yd^3) for each part of the waste stream (residential, industrial, commercial, etc.). The design called for weighing at least 30 collection vehicles for each type of waste collected. Dividing the net weight (load weight) of a vehicle by its volume as recorded in landfill records results in a specific bulk density value for that load. Both the City and County conducted short weigh programs at their landfills of 5 and 4 days respectively, in order to obtain this bulk density data. It was desired to obtain at least 30 bulk density values for each type of refuse collected; however, over the short duration of these tests it was not possible to do so for all waste categories in question. The vehicles of one waste category (private cars and pickups) were not weighed at all; therefore, an assumed bulk density for this category was obtained from County personnel.

Once calculated, the various bulk density values for each waste type were plotted on normal probability paper to see if the assumed categories were adequate for estimating purposes. If, for example, compaction trucks hauling municipal waste had radically different fill ratios and densities, the data would plot as two lines. A single line was expected to show the bulk densities to be normally distributed. To plot, the densities were arranged in ascending order and the probability of an individual occurrence assigned, using a table of standard normal deviates.

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*Subscript indicates the number of days in the week used in the conversion.

The average (median) bulk densities are denoted by the 50-percent probability level. This is interpreted as meaning that there is a 50-percent chance that a bulk density will be higher than the median. If the distribution is normal, use of the average value should result in a reasonable estimate of solid waste tonnage. Of course, since waste composition changes with season, repeating the program throughout the year would be preferred over the procedure adopted for the prefeasibility study.

b. Analysis of historical data--Each waste category, excluding brush, on the City and County landfill logs is compiled separately as average yd^3/day for each month. This averaging is based on the number of days per month and is computed by dividing monthly yardage by the number of days in that month.

c. Conversion of cubic yards per day to tons per day--In the first step, the bulk density data from Step a. for each waste category are applied to the corresponding average monthly yd^3/day obtained in Step b., in order to convert the average monthly yd^3/day to average monthly TPD. The resulting TPD for each waste category and the total TPD at each landfill for the time periods chosen are then plotted on normal probability paper. Since the City and County landfills have been analyzed separately, the total amount of processable waste available for use at a Rome-Floyd County recovery facility is the sum of the two individual totals. In order to perform preliminary material and energy balances and estimate revenue from the sale of recovered materials and/or energy, the average total TPD is used. As stated above, this corresponds to the 50-percent probability level and has been calculated to be a total of 210 TPD. The sizing of plant process equipment, however, is predicated on a higher probability level, in order to ensure that there is adequate plant capacity for peak waste generation days. This is necessary, since the rate of waste feed to the plant is not constant but will vary from day to day (e.g., total City tonnage exhibits a range of 80 TPD to 110 TPD, as shown in Figure 2.2). A probability level of 95 percent was chosen for sizing plant equipment, because this level results in a 95-

percent likelihood that the actual MSW arriving at the plant will be processed without overtime when the process line is in working order. From Figures 2.1 and 2.2 this is seen to be approximately 250 TPD.

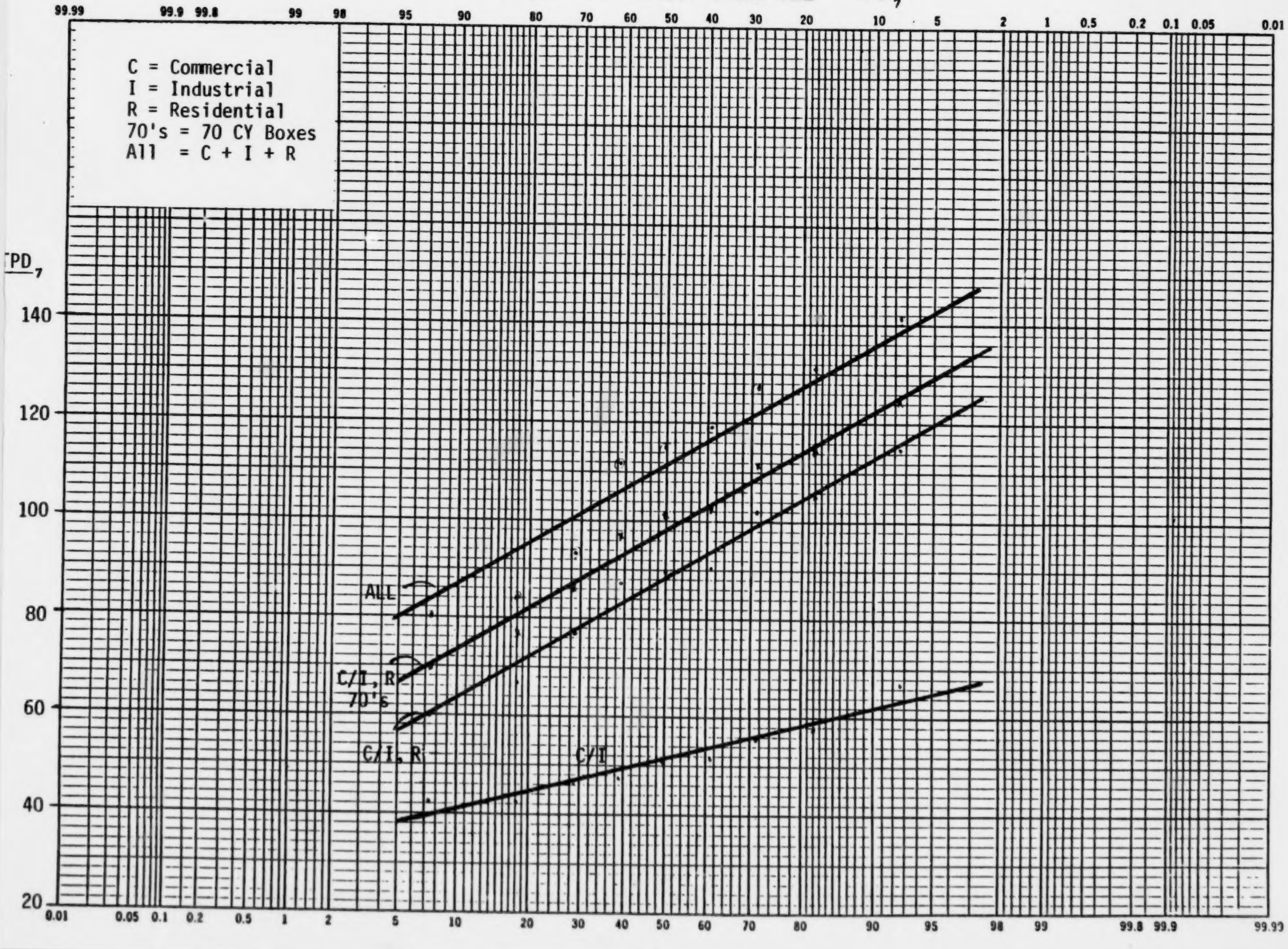
Synopses of the individual City and County weigh programs are given below:

County -

- 4-day weigh program conducted.
- Bulk densities were obtained for the following waste categories: County-owned, 70-cubic-yard containers (100 lb/yd^3); privately hauled commercial/industrial (172 lb/yd^3); privately hauled residential (260 lb/yd^3). Bulk density of private cars and pickups was assumed to be 150 lb/yd^3. Residential and 70-cubic-yard containers show a normal distribution; commercial/industrial was assumed to have a normal distribution, but due to the small amount of data collected this could not be confirmed. Additional studies, however, should be conducted so that better analysis can be made for the commercial and industrial segments of the waste stream.
- Historical data for the time period of April 1978 through December 1978 were compiled into average monthly yd^3/day for five waste categories: cars and pickups, 70-cubic-yard containers, privately hauled residential, privately hauled commercial/industrial, and carpet waste. (The latter is only disposed of at the County landfill.) These data have a normal distribution.
- Historical yardage data converted to TPD estimates are displayed in Figure 1. Roughly half of the waste brought to the landfill is privately hauled commercial/industrial. Average waste quantity (50% level) disposed of at County landfill is approximately 110 TPD. Carpet waste is excluded from this total for reasons discussed later in this section under "Waste Characteristics."

K+E PROBABILITY X 90 DIVISIONS 46 8000 MADE IN U.S.A.
KEUFFEL & ESSER CO.

Figure 2.1 COUNTY LANDFILL - TPD$_7$



City -

- 5-day weigh program conducted.
- Obtained bulk density of 374 lb/yd^3 for City compactor trucks (only City vehicles weighed; haul both residential and commercial waste). Cars and pickups were assumed to have a bulk density of 150 lb/yd^3 and privately hauled commercial loads were assigned the figure of 172 lb/yd^3, based on the County study. Compactor results yield the expected normal distribution.
- Historical data for the time period of January through December 1977 and January through June 1978 were compiled into average monthly yd^3/day for the City-collected waste, cars and pickups, and privately hauled commercial waste. Again, all were found to be normal distributions.
- Historical data were converted to TPD, using the bulk densities noted above and the resultant distributions presented in Figure 2.2. The average quantity of processable waste disposed at the Rome landfill is seen from the figure to be about 100 TPD.

In conclusion, it can be seen that the City of Rome is currently responsible for approximately half of the total processable waste generated in Floyd County.

Based on current trends, it is estimated that the future growth in waste generation rate for Floyd County would be about 1 percent per year.

2. Waste Composition--Because the objective of the technical assistance activity was to determine whether resource recovery appeared feasible, a detailed composition analysis of the area's solid waste, suitable for contract specifications and plant design, is not required. However, should the County and/or City decide to undertake implementation of a recovery project under Phase I of the President's Urban Policy Grant Program, then a composition analysis program will be required--at least with respect to heat value, moisture and ash content, and tonnages of certain wastes which are judged to be unprocessable. Any composition analysis undertaken as part of the Urban Policy program should be structured to

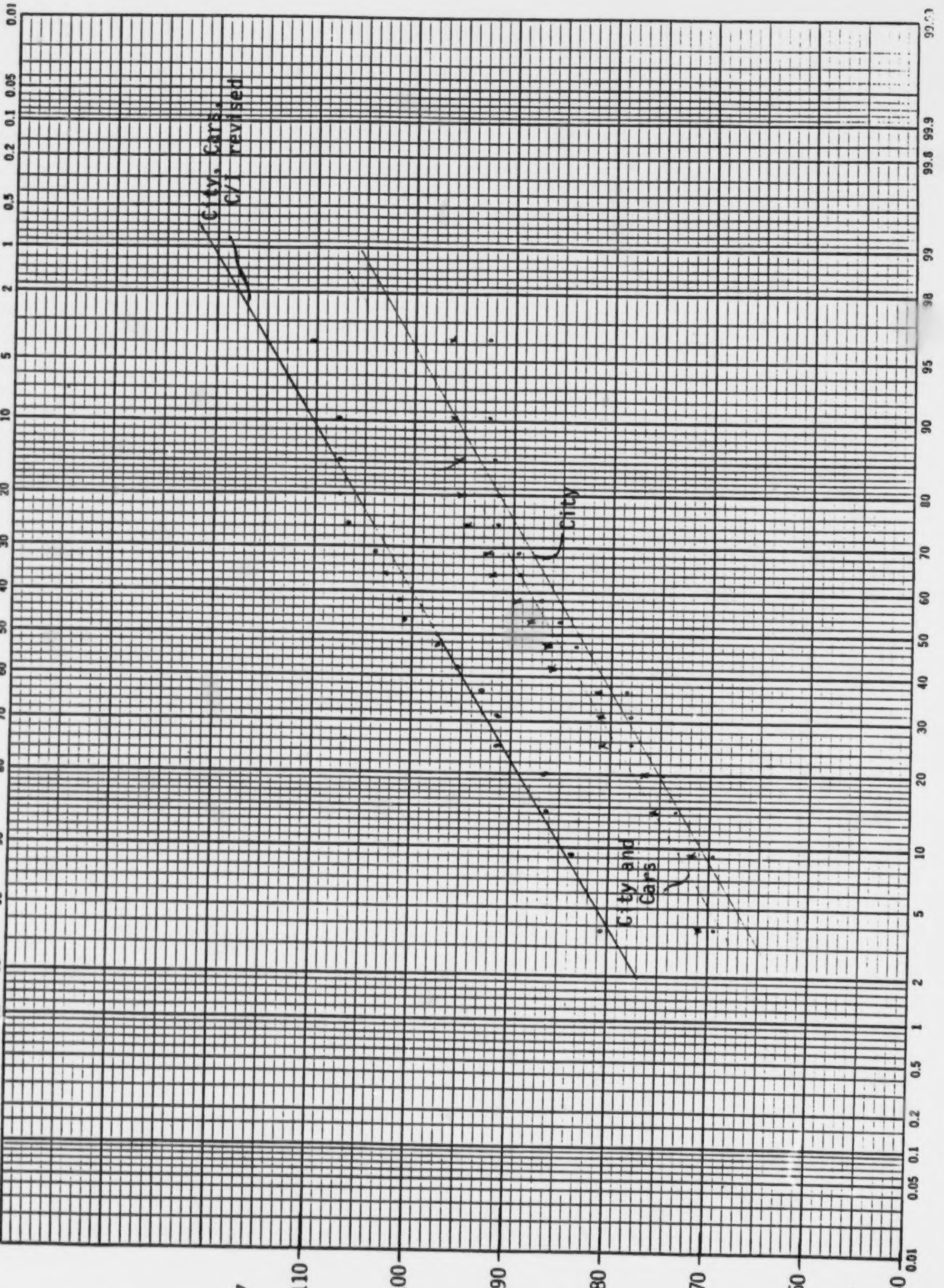


Figure 2.2 HISTORICAL DATA - ROME FILL (1977-78) (Rev. 1/14/79)

obtain the data needed to build the type of system selected for further analysis and for any particular requirements or concerns of the energy buyer.

For purposes of general feasibility determination, the composition of the solid waste in Floyd County has been assumed to be similar to that of nearby DeKalb County, Georgia* (another primarily residential county, but one with a higher per-capita income), with one modification (Table 2.1). This modification is a reduction in the aluminum concentration from 1 percent to 0.5 percent, due to the fact that the aluminum content of Floyd County waste appears low. The waste composition as given in Table 2.1 omits industrial waste, since most industrial waste (carpet, construction debris, etc.) is not generally considered a suitable feed material for materials or energy recovery systems. In order to develop energy balances for use in comparing alternate technologies, the heat

TABLE 2.1

ROME/FLOYD COUNTY WASTE COMPOSITION

Category	Percent
Paper	47.9
Plastics	4.0
Wood	1.9
Textiles	3.3
Rubber	0.7
Yard Waste	13.7
Food Waste	3.3
Residue (inerts)	11.7
Glass	4.5
Ferrous	8.1
Aluminum	0.5
Non-ferrous	0.4
	100.0

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*Solid Waste Energy Recovery and Materials Reclamation Feasibility Study for DeKalb County, Georgia, HDR, Atlanta, Georgia, December 1975.

content of the unprocessed waste was estimated to be approximately Btu/lb, typical of wastes with little wet garbage and consistent with the assumed composition.

B. Special Waste Characteristic Considerations

In order to successfully implement a solid waste facility project, it is important to identify any outstanding or unusual characteristics of the solid waste stream. For a Rome/Floyd County project, two such characteristics are evident: less-than-average aluminum fraction and the presence of carpet industry waste. The estimate of a low aluminum fraction in the waste stream is based upon contact with the three buyers of aluminum cans in Rome and the fact that the Coca-Cola Bottling Company operations in Rome uses steel cans. For metal beverage containers, it appears that only beer cans are aluminum; all others use steel as the major can stock in northern Georgia. Contact with Alcoa indicates that on the average they buy about 8 tons per month of aluminum cans in the Floyd County area. Reynolds, on the other hand, reports that their twice-monthly recycling center in Rome yields on the average about 2 tons per month. This is less than the average collected by Reynolds at any one of their recycling centers in the Atlanta area. North Georgia Distributors reports that they buy about 2 tons per month of aluminum cans, which they in turn sell to Reynolds. (Presently, it is not clear whether some double counting may exist in the reported tonnage estimates of recycled aluminum cans.) It is probably uneconomical to perform mechanical aluminum recovery at a solid waste facility, due to the combined effects of the following:

- apparent low initial aluminum concentration in waste stream,
- existing recycling operations appear to remove a significant fraction of the aluminum,
- a recovery efficiency, at best, of only about 60 percent of the aluminum throughput using commercially available aluminum recovery equipment, and
- economic energy recovery precludes preparation of an aluminum concentrate in small plant situations.

The second notable waste characteristic is the presence of large amounts of carpet waste generated by the mills in the Rome vicinity. The major portion of this waste is in the form of carpet trimmings, some are baled at carpet mills prior to disposal at the landfill. These trimmings are narrow strips of carpet material that are frequently over 100 feet long. The remainder of the carpet mill waste is primarily paper and heavy cardboard tubes. These latter materials would be processable either in a facility utilizing mechanical beneficiation for RDF production or thermal disposal with heat recovery. The carpet trimmings, however, present major potential problems for both alternatives. Even if the bales of trimmings are sliced into smaller sections, excessive lengths might not be substantially reduced. For a system producing RDF, this poses a severe problem in materials handling, since this type of material would wind up and jam a shredder. When considering incineration, carpet trimmings are a drawback--not from a materials handling point of view, but because the synthetic fibers will melt before burning in a furnace. Melting could result in clinkering, ash handling and combustion air port plugging problems. It is felt that the best way to alleviate these difficulties is to separate all carpet trimmings at the point of generation and dispose of them directly to the landfill. On the basis of the County weigh study, it is estimated that about 11 TPD of carpet trimmings will require separate disposal. If ongoing research by carpet trade associations is successful, much of this material might be recycled by the industry and be removed from the waste stream.

III. MARKETS FOR RECOVERED ENERGY AND MATERIALS

Solid waste contains resources which are recoverable using technology that is currently available today or in the process of being developed. The types of resources that could be recovered consist of recyclable materials, and other materials that can be converted into energy. In order to successfully market these resources, the following factors need to be taken into consideration;

- adequate and continuing supply of materials
- waste composition
- technical ability to match recovered resources to market needs
- proximity of potential buyers to the source of waste
- various economic, legal and environmental factors.

The purpose of this section is to report on the investigation of potential buyers for selected recovered materials who are located within a reasonable transportation cost radius of Floyd County, and buyers for either RDF or process steam. The objective of the market investigation was to determine whether there were prospective candidate buyers for recovered materials and energy, and to obtain information on their quantity and quality requirements and an indication of the current prices being offered in the case of materials buyers, and for candidate energy buyers an indication of the basis upon which a price for RDF or process steam would be established. The information gathered from the market investigation has been used to determine whether the market situation appeared sufficiently promising to warrant further investigation by the City and County. In the case of candidate energy buyers, the information has provided the basis for establishing the preliminary economics of energy recovery alternatives.

A. Materials Recovery

Based upon the waste characteristics reported in Chapter II, estimates of the potential tonnage of recovered materials existing in the solid waste generated in Floyd County are presented in the Table 3.1 as a frame of reference for the discussion on materials markets. Also represented in this table are estimates of the tonnage of materials currently being recycled, based upon data compiled for the various recycling activities within the City of Rome.

TABLE 3.1 ESTIMATES OF MATERIALS RECYCLING

Material	Potential Annual Tonnage	Estimated Tonnage Recycled	Percent Recycled
Paper:			
News, corrugated & office	23,010	2,960*	12.8
Magnetics	15,120	0	0
Aluminum	510	144**	28.2
Non-Magnetics	290	0	0
Glass	3,300	n.a.	n.a.

*Rough estimate, based upon expansion of partial data from Clean Community Commission and estimate obtained from Rome Waste Paper Company. If only the City's waste were considered, the percentage of news, etc. recycled would be approximately doubled.

**Based upon information supplied by Reynolds, Alcoa and North Georgia Distributors.

n.a.Tonnage data not available on the glass recycling program of the Clean Community Commission. The glass program has not been in operation sufficiently long as to establish adequate records, and it has also been plagued by high levels of contamination.

1. Ferrous Materials--The buyer contacted was a scrap dealer in Atlanta. He established two product grades:

- baling material - all light ferrous metal, excluding food and drink cans ($28/gross ton)
- heavy scrap - auto parts, pipe, etc. ($40/gross ton).

If metal is not separated into the above grades but is collected in one container, the lower price applies. Food and drink cans are excluded because of their tin content. It appears that the local ferrous dealers feel that the market for tin-coated containers is not sufficiently viable for them to purchase this material. They recommend detinning the metal at the recovery site or selling direct to a detinner. Of the total potential annual tonnage of ferrous product estimated to be found in the Floyd County solid waste stream, less than half, or about 2700 tons per year, would represent steel cans. Since the nearest detinner is located in Tampa, Florida, it can be expected that the cost of transportation to such a distant market (over 500 miles one way) would make the recovery of steel cans uneconomic. For example, haulage by truck is likely to cost anywhere from $0.75 to $1.10 per mile, or over $1,000. Assuming a maximum payload of 20 tons of steel cans, transportation costs would approximate $50 per ton--about the price per ton that could be expected to be paid by the detinner.

The scrap metal dealer would supply collection trailers to a facility in Floyd County and provide transportation for hauling filled containers 36,000-40,000 lb) to Atlanta; transportation cost is not included in aforementioned prices. After allowance for transportation costs of $0.75 to $1.10 per mile, or an estimated $7.00 per ton to $8.75 per ton, the minimum net price to be realized would be slightly less than $20 per ton. At this minimum net price, a recovery project might generate on the order of $64,000 per year as a contribution toward debt service and annual O&M of a recovery project. This assumes that the magnetic, non-can material is over 3,000 TPY, which may be an optimistic assumption for the quantity of residential and commercial solid wastes generated in Floyd County.

2. Aluminum/Non-Magnetic--Three potential buyers were contacted regarding this stream, a scrap dealer, Alcoa, and Reynolds Aluminum. The scrap deal is the same one contacted for magnetic materials. This dealer would purchase an aluminum/non-magnetic mix collected in one container. Aside from the requirement for no contaminants (paper, wet garbage, etc.) in this metal, no material specifications exist. A current price estimate (based on a low percentage of aluminum) is $.10/lb ($200/ton), with a final price depending on the ultimate metal concentrations in the mix. The collection and transportation procedures are the same as for magnetic metal.

Reynolds expressed an interest in purchasing an aluminum/non-magnetic mix, but with aluminum recovery as the ultimate goal. They have no use for the non-magnetic fraction. (See Appendix A for appropriate specifications.) Therefore, in order to make selling this stream to Reynolds profitable, the aluminum concentration would have to be as high as possible. Otherwise, potential revenues from the separate sale of the remainder of the non-ferrous stream would be lost.

Reynolds is proposing to install aluminum recovery systems at a number of their Aluminum plants and purchase mixed aluminum scrap. One such plant under consideration is in northwestern Alabama at Wilson Dam, but the company had made no firm decision at the time they were contacted. Since they have no currently operating recovery plants, they have neither the operating experience nor the historical data necessary to supply a price for the material or the optimum aluminum concentration in the mix. Instead, Reynolds encourages aluminum recovery at the solid waste disposal facility using existing technology (e.g., eddy current separation followed by an air knife), in order to create as rich an aluminum product as possible. However, because of the low aluminum/non-magnetic concentration in the waste stream, the low demonstrated recovery efficiency (about 50%), general incompatibility with the energy recovery system conceptualized for this analysis, and high capital cost of recovery equipment, it is not considered economically attractive to reclaim the aluminum/non-magnetic stream as a marketable product, despite the apparent buyer interest in this material.

Moreover, there are three existing buyers (including Reynolds) of aluminum cans located within Rome that are actively seeking to purchase this aluminum product generated through recycling efforts of civic organizations. Current estimates of aluminum can recycling suggest that about 28 percent of the aluminum in the waste stream is being recovered through source separation. This estimated recovery efficiency is equivalent to about 60 percent of that possible with a mechanical approach. With improvements in operating days and hours of operation at these three locations, household recycling activities could be expected to recover an even greater proportion of the aluminum cans in the solid waste stream, especially in the City of Rome, at a far lower cost than possible through mechanical processing. Because the price per pound is substantially higher for aluminum cans than for a mixed aluminum/non-magnetic product, the Clean Community Commission should consider broadening its public education efforts to encourage greater aluminum can recycling. Since individuals are likely to have difficulties discerning the difference between thin wall steel cans and aluminum cans, the Commission might consider identifying by brand name those beverage cans which are aluminum.

3. Glass Cullet--Owen-Illinois in Atlanta was contacted. Their specifications, as follows, are quite stringent:

- Cullet must be free of stones, ceramics and metal.
- Cullet can contain < 1% plastic.
- Paper attached to glass (e.g., labels) is allowable.
- Window panes, TV tubes or mirrors are not acceptable; only container glass.
- Cullet must be separated into colored and clear.

They have volunteered the services of their lab to establish the quality of the glass product from a Floyd County facility. The current price for cullet is $30/ton; if over a ton is shipped in excess of 50 miles to reach their plant, the price is increased to $40/ton. At this time, they do not supply customers with collection trailers or transportation to their plant; however, they anticipate that this policy may change in the near future.

Even though there is strong interest on the part of the manufacturer to purchase cullet, the exacting specifications, in addition to the poor economics of mechanical glass recovery at waste tonnages less than 1000 TPD, tend to make glass recovery at a Rome-Floyd facility an unfavorable option.

The difficulties of meeting stringent specifications are further attested to by the experience of Rome during the 7 to 8 months which it has had a glass recycling program in operation. The high levels of contamination of glass deposited in the 6-cubic-yard container which has been experienced in Rome has also been found in many other communities undertaking glass recycling where close inspection and supervision of glass before its deposit into a container has not existed and where a vigorous, on-going education program has not been in place. Furthermore, experience in other communities (where contamination has been minimal) suggests that the economics of glass recycling are not especially attractive due to transportation costs associated with delivery of the product to the glass buyer. In addition, there is always the uncertainty (in the absence of strict quality controls) whether a shipment of glass will be accepted by the buyer.

4. Paper Products--The principal type of paper that would lead to economical recovery is newsprint, office papers and cardboard. However, current recycling activities in the form of the Rome-Floyd Clean Community Commission dropboxes, monthly municipal collections, and the Rome Waste Paper Company baling operations are satisfactorily accomplishing recovery of these paper products. Consequently, since the economics of additional paper recovery at a resource recovery facility appear to be marginal, no market investigation was undertaken.

B. Energy Recovery

The market investigation revealed that the strongest candidate for the purchase of recovered energy was the Georgia Kraft Company, who is interested in the purchase of RDF. While General Electric was identified as a potential steam customer and some interest was expressed by plant personnel in purchasing steam, the General Electric location is such that siting an energy recovery facility within a reasonable steam transmission distance appears to offer significant difficulties. Carpet mills that were contacted did not appear to have sufficient hourly steam loads to justify further consideration. In addition to G.E. as a potential customer, the City has expressed an interest in using a waste-to-steam facility to attract new industry to its industrial park. Lacking a specific customer at this time, it should be recognized that should a steam production project be implemented, there is considerable risk that in the early years of operation a steam facility would essentially serve as an incinerator with no energy revenues to help defray annual debt service and O&M costs.

Georgia Kraft has two multi-fuel boilers used to burn bark. Each of these boilers uses 400 TPD of bark, for a total bark consumption of 800 TPD. Georgia Kraft generates approximately 500 TPD of bark from its in-house operations and purchases 300 TPD of bark. It is currently paying $6-$7 per ton for purchased bark. The company estimates that the heat value of the bark is 4200 Btu per pound, or 8.4 million Btu per ton. Thus, the price of bark is currently about $0.70 per million Btu. This price is less than the $1.42 per million Btu paid by the company for coal, because of lower boiler efficiencies due to the high moisture content of bark, and higher bark handling costs.

Georgia Kraft has indicated that they would be willing to purchase RDF as a replacement for purchased bark. Because RDF has a higher heat value and lower moisture content than purchased bark, it will be necessary for the County and City to negotiate a fair price for RDF.

IV. SOLID WASTE MANAGEMENT OPTIONS

This chapter contains a brief description of the current disposal techniques practiced in the Rome-Floyd County area, and presents the results of an assessment of several options to the current disposal system. Options investigated include the opening of a third (and possible fourth) landfill in the County, based either on a cooperative arrangement between the City and County for a single new landfill, or individual undertakings which within the next decade would require two new landfills. Also investigated were two system approaches to energy recovery: 1) the production of RDF with the Georgia Kraft Company as the candidate buyer, and 2) the production of process steam. All of the options considered pose, to varying degrees, site location issues affecting their viability, which must be addressed by the City and County in determining the future direction in which to proceed with respect to solid waste disposal.

No detailed assessment was made of the desirability or feasibility of implementing a source separation program for three principal reasons. First, the City of Rome appears to have a fairly extensive voluntary recycling effort underway with respect to paper and aluminum cans. The amount of voluntary participation in these recycling activities appears reasonably high and could probably be increased without resorting to a formally City-sponsored source separation program involving a curbside collection system. It seems doubtful that a source separation program for paper and aluminum would yield substantially higher participation rates without requiring mandatory separation of these two materials by all households and businesses within the City. A mandatory program would of necessity entail establishment of penalties for failure to comply, establishment of an enforcement program, and also would require development of procedures for and training of City collection crews on how to deal with violators, including those who included unacceptable levels of contaminants in bundles of paper and containers of aluminum cans.

Second, the markets for tin cans and glass bottles and jars for all practical purposes are non-existent; thus, in contrast to the situation found in many other communities, they do not justify inclusion in a source separation program (or for that matter, voluntary recycling activities).

Moreover, removal of these two potentially recyclable materials from the waste stream, while providing an important positive contribution to the technical performance of an energy recovery system, provide a relatively low contribution to reducing the volume of solid waste which must be disposed of in a landfill. Absent any strong economic return for segregating these materials from refuse on the part of households and businesses, it was felt that little contribution would be made by introduction of a comprehensive source separation program over current voluntary recycling activities in the City.

Third, it appeared difficult to imagine a County-instituted source separation program being successful where collection of residential and business wastes was so dependent upon private haulers, as well as individuals taking their wastes to either a 70-cubic-yard container or directly to the landfill. For source separation to work in the area outside the City would require the willingness of haulers to modify their vehicles, perhaps their collection practices, and, perhaps, require a financial incentive in the form of a sharing in the revenues from the sale of recovered products. It also would require that the County modify each of its 70-cubic-yard containers so that refuse and recyclable materials could be segregated from one another, and would require 24-hour staffing of each location in order to assure that storage compartments in the containers designated for each recyclable material were not filled with refuse or other contaminants. In addition, the County would need to provide special containers for recyclable materials and supervisory personnel at its landfill for those households and businesses who bring their own solid waste to that facility.

A. Current Disposal Techniques

This section contains a separate, brief description of the current collection and disposal practices within the City of Rome and for the remainder of the County.

1. City of Rome--The Sanitation Department operates both municipal refuse and brush and leaf collection service (12 trucks for the first, 11 for the latter). Commercial service is worked in as part of the regular household collection. The City also operates a sanitary landfill

with a projected life of at least 10 more years. This landfill has a separate area for hazardous waste (industrial sludge) disposal. Industrial collection is provided by the only private collection service operating in the City; all industrial waste must be disposed of in the County landfill. In 1978 the City's budget for collection and landfill operation was $853,425.

2. Floyd County--Household disposal is achieved by private individuals bringing their waste to the County's sanitary landfill (Berry Hill), disposing of it in the three regional 70-cubic-yard containers supplied by the County (a fourth, near Cave Spring, was recently closed due to vandalism problems), and private haulers. Commercial/industrial collection is performed by private haulers (eight are full-time operations), who also dispose at the landfill. This facility accepts only non-hazardous wastes. Remaining landfill life is estimated to be at 7 years. In 1978 the County's budget for its limited collection activities and for operation of the landfill was $69,480. According to the Rome-Floyd County Planning Commission, "It should be noted that these figures do not include much of the overhead and expenses of this (Solid Waste) department because it is impossible to separate figures from the Road Department operation."

B. Future Disposal Options

1. RDF and Steam Production Systems--Based upon the market investigations, the availability of only 210 TPD of processable solid waste, and the assumed composition of the Floyd County waste, the following processes were chosen for analysis:

- RDF production utilizing a scalping system
- steam production using a controlled, starved air combustion system with waste heat recovery.

Each of the processes offer the advantage of greatly reducing the volume of waste to be landfilled; hence, extend significantly the useful life of the two existing landfills. Both processes also appear economically competitive with the option of opening a third (and perhaps, fourth) landfill within the County, especially when haul costs are taken into consideration. However, both energy processes present siting issues, especially a steam production facility designated to serve industry located within the city limits of Rome. In general, the siting issues associated with an energy recovery facility are less acute than those associated with the siting of a landfill. Whether this generality is applicable in Floyd County will depend upon the exact site location selected.

In considering an energy recovery facility it is important that its design incorporate a reasonable degree of reliability and availability in order to assure that solid waste is disposed of on a regular basis. Reliability and availability are dependent upon such factors as:

- operational reliability of equipment,
- equipment or system redundancy,
- combination of waste storage capacity and excess processing capacity to handle temporary surges in tonnage, and
- conditions imposed by the buyer of energy.

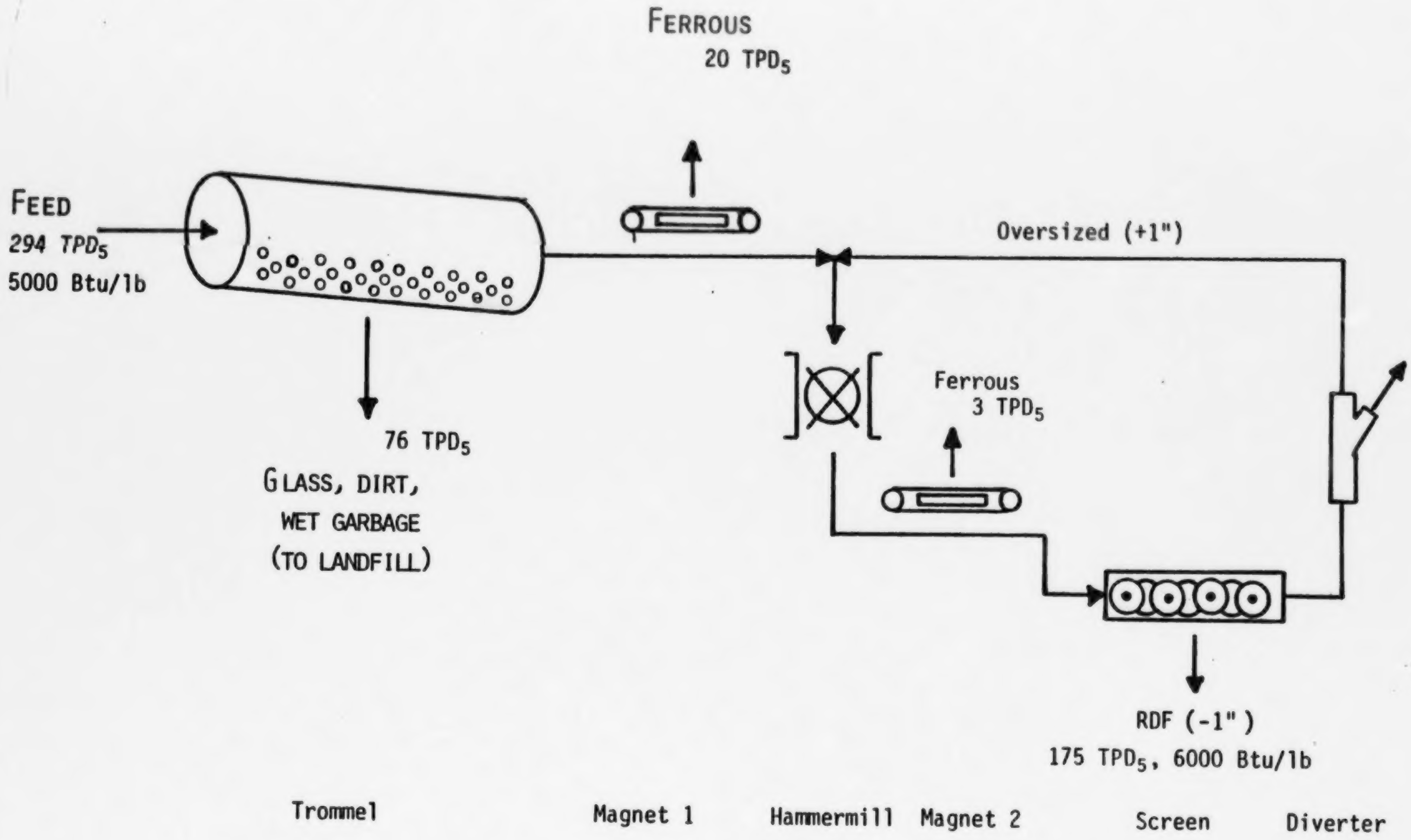
Determination of the amount of reliability desired involves a trade-off among system capital, operating costs, and energy revenues (and their combined effect upon net disposal costs or tipping fee). The process systems investigated intentionally avoid the issues of redundancy and capacity sizing to maximize waste processing.

a. RDF production--Because of the low waste tonnage in question, the presence of a strong RDF market (Georgia Kraft) and the absence of satisfactory materials markets, the fairly simple RDF production scheme shown in Figure 4.1 has been developed. The process intentionally avoids redundancy and rejects significant portions of the waste stream based on incremental investment analysis, which indicates that further recovery cannot be justified and that landfill back-up is more economic than additional equipment. No attempt is made to recover materials as potential products. Magnetic metal recovery is performed to reduce shredder operating costs and reduce fuel ash content. Also, reducing the magnetics content of RDF reduces problems associated with combusting RDF, including boiler wastage and heavy metal emissions from the boiler, and heavy metal leaching from boiler ash. The RDF production scheme described herein is estimated to generate only 110 TPD$_5$ of residuals, including carpet trimmings rejected as unprocessable, which would require disposal at a landfill. At this tonnage, and considering the increased density of the rejects, remaining landfill life would be extended by approximately 6 to 7 times. Residual tonnages produced at each stage of processing are indicated in Figure 4.1 and identified in the following description of the system.

The feed to the process (274 TPD$_5$) is based on the design point defined in Chapter II. Since carpet trimmings will have been removed from the feed for separate disposal, the feed enters directly into a trommel with 1"-2" diameter holes. The trommel removes 76 TPD$_5$ of abrasives, such as glass and dirt, in addition to wet garbage and some yard trimmings. The primary magnet removes 20 TPD of magnetic material from the hammermill inlet stream. The hammermill, which produces a product of which 95 percent is smaller than 2 inches, is equipped with a sizing circuit consisting of a secondary magnet, a disc screen, and a diverter. The secondary magnet removes 3 TPD$_5$ of magnetic metal from the hammermill outlet stream. In the disc screen, oversized material (+1") is separated from the product fluff RDF (175 TPD$_5$ @ 6000 Btu/lb) and then conveyed back to the hammermill. The trommel unders and recovered magnetic metal are also sent to a landfill for disposal.

Since there is not sufficient land available at the Georgia Kraft mill to locate a RDF facility, the RDF product would be transported to Georgia Kraft by transfer trailer. At Georgia Kraft the compacted RDF would be ejected from the transfer trailer and passed through a fluffer to return the RDF to its original "fluff" condition. The RDF is then transported pneumatically to a cyclone, which de-entrains the RDF from the air and feeds it by way of a rotary valve, into the existing bark metering bins located above the boilers.

Figure 4.1 RDF SYSTEM FLOWSHEET


FEED
294 TPD_5
5000 Btu/lb
FERROUS
20 TPD_5
Oversized (+1")
76 TPD_5
GLASS, DIRT,
WET GARBAGE
(TO LANDFILL)
Ferrous
3 TPD_5
RDF (-1")
175 TPD_5, 6000 Btu/lb
Trommel
Magnet 1
Hammermill
Magnet 2
Screen
Diverter

Because of the relatively small amount of RDF being produced compared to the combustion requirements of Georgia Kraft's CE VU-40 boilers, the RDF will be fired as it is delivered to the plant. The type of firing should not jeopardize plant performance. Furthermore, this approach should increase system reliability by eliminating relatively expensive and unreliable storage bins.

Perhaps the greatest concern is the ability of the furnace bottom ash handling system to manage the extra ash associated with RDF combustion. The results of test work by Teledyne using RDF made in Cockeysville, Maryland indicate that the RDF ash should burn without incident and clear the grate as long as most of the glass has been removed prior to combustion. The adequacy of the bottom ash handling system to manage 15-20 percent ash content fuel should be investigated. The impact of RDF fly ash on the electrostatic precipitators (ESP's) cannot be predicted at this time. Given the status of the ESP's designed to handle coal/bark and black liquor carry over simultaneously, addition of RDF ash should not have an adverse impact. The SCA (Ft^2/1000 ACF of gas) for the units, face velocity and field strengths are all within accepted design limits for municipal incinerators. Hence, the units should continue to perform in an exemplary manner. RDF dust is removed from the conveying air in a dust collection system and also sent to the boilers.

A preliminary engineering cost summary for conceptual RDF production facility is presented in Appendix B. The total value of the bond issue (in 1984 dollars) is estimated at $8.4 million. This includes cost for all equipment; buildings; construction management; engineering fees; start-up, testing, modifications and acceptance costs; and investment banker and bond counsel fees. As discussed in Chapter V, it is suggested that the City and County jointly activate a Resource Recovery Development Authority. Under Georgia law such authorities can finance resource recovery projects only through the issuance of revenue bonds. At an assumed bond interest rate of 7%/year and a plant life of 20 years, the debt service for this facility would be $828,000. Operating costs for this facility are estimated at $1,502,300 and include the cost of 13 operating personnel, equipment maintenance costs, fuel and utilities, equipment depreciation, insurance, residual disposal, and other miscellaneous costs (including private operator fee). The cost of landfill disposal (including the cost of transportation) for the residuals from the plant and the entire 210 TPD feed stream (when the plant is down) is estimated to be $285,000. Revenues are based on the sale of RDF at a 1984 price ranging from a low of $13 per ton to a high of $28.50 per ton. The lower price reflects the current price paid for bark adjusted for the higher heating value of a ton of RDF and escalated by a projection of the change in the Consumer Price Index between 1979 and 1984. It should be noted that the price does not reflect changes in the price of bark due to changes in supply and demand. It seems reasonable to expect the demand for bark to increase as other energy users seek alternative fuels to oil and coal. At $13 per ton, the sale of RDF is estimated to yield revenues of $590,000 in 1984, based upon a 95-percent availability factor. The higher price reflects the current fossil fuel price paid by Georgia Kraft, which was escalated by a projection of the change in the Consumer Price Index between 1979 and 1984. This would appear to represent the maximum basis for pricing RDF. At $28.50 per ton, the sale of RDF in 1984 is estimated to yield revenues of nearly $1,300,000.

Since a landfill would be required for the disposal of residuals as well as non-processable wastes, it is important to account for this cost in order to establish the total disposal system cost to the County and City. For purposes of analysis, it has been assumed that a new landfill meeting EPA Landfill Guidelines would be established and in operation by 1984. Acreage requirements for a landfill with a 20-year useful life would be approximately the same as that required if the County developed a new landfill to handle solid waste generated outside the City of Rome in the absence of a resource recovery facility. With a resource recovery facility, the annual tonnage needing to be disposed at a landfill would be approximately half that needing to be landfilled by the County and City without such a facility. As a result, some saving (an estimated $258,000) in capital costs (debt service) and annual O&M cost should be realized over those for joint County-City landfill operation involving no resource recovery facility. (See Appendix B.) The 1984 total annual cost for the landfill operation is estimated to be slightly in excess of $1 million. Of this annual cost, nearly $400,000 is estimated to be paid for by the resource recovery facility for the disposal of residuals. Thus, the net cost for landfill operations is approximately $650,000. The contribution of nearly $400,000 out of the O&M cost of a RDF facility for residual disposal, plus the overall savings in total annual costs associated with operating a landfill where there was no resource recovery facility has been treated as a credit in deriving the total system disposal cost for a program involving a RDF facility. As a result, the net system disposal costs (after deductions of RDF revenues and the landfill credit) in 1984 are estimated to range from a high of $1,725,000 ($17.60 per total ton of solid waste generated in the County) to a low of $1,020,000 ($10.40 per ton).

The preliminary economic analysis for the RDF facility clearly indicates how critical the establishment of a fair price for RDF with Georgia Kraft is to the viability of this recovery option. In order to achieve a total disposal system cost of $13 per ton (the same as estimated for a joint County-City new landfill meeting EPA Landfill Guidelines, the 1984 price for RDF would have to be around $1.90 per million Btu, or about $1.13 in 1979 dollars. Converting the 1979 price per million Btu to a price per ton of RDF (12 million Btu per ton) yields a price of slightly under $13.60 per ton. While the estimated "fair" price per million Btu is higher than Georgia Kraft currently is paying for bark, it benefits by: a) being able to count on a known supply of fuel, and b) minimizing uncertainties associated with near-term changes in the supply and demand picture for purchased bark. In other words, it seems reasonable to expect Georgia Kraft to be willing to pay a "premium" for what would amount to a captive supply of fuel.

Establishment of the viability of a RDF project also depends upon a number of other factors in addition to the basis for pricing this fuel. It is imperative that the County and City as quickly as possible begin serious discussion with Georgia Kraft to determine the depth of their willingness to contract for the purchase of RDF and the terms and conditions required to obtain a commitment from them.

b. Steam production--As a result of the relatively small amount of waste available for processing, a steam production facility utilizing starved air combustion of solid waste in modular combustion units has been conceptualized for analysis. Figure 4.2 shows the overall material and energy balances, while Figure 4.3 provides a cross-sectional view of a typical starved air combustion unit. The Floyd County facility would consist of two batteries of three 50 TPD municipal solid waste units equipped with semi-continuous ram feeders for the solid waste input semi-continuous ash discharge, automatic combustion controls, and a waste heat recovery boiler. Each battery of units is designed to raise approximately 31,000 lbs/hr of 250 psig saturated steam, when burning solid waste with an as-received heat content of 5,000 Btu/lb. This corresponds to a system efficiency of 60 percent.* Particulate air pollution is minimized by careful combustion control without the use of of particulate removal equipment or use of auxiliary fuel during normal plant operations.

Solid waste delivered to the plant is stored on a tipping floor. To prevent synthetic fibers melting and fouling the furnace, the carpet trimmings are removed for separate disposal. The waste is then fed by ram-feeders servicing each unit into the incinerator's primary combustion chamber. In the primary chamber the fixed carbon in the waste is oxidized by low-velocity air under the fuel bed. This provides the heat required to dry and devolatilize the waste. The substoichiometric combustion in the primary chamber produces a carbon monoxide-rich gas which passes into the secondary chamber, where it is mixed with staged combustion air. This secondary chamber acts as a low-Btu gas burner and burns the products of pyrolysis and partial combustion. The hot gases leaving the secondary chambers from each set of three units are combined and pass through a heat exchanger in order to produce steam. Ash (94 TPD$_5$) is discharged by a periodically activated ash discharge ram through a water-cooled ash chute to a water quench/seal. It is removed from the quench tank by a drag chain conveyor and collected for landfill disposal.

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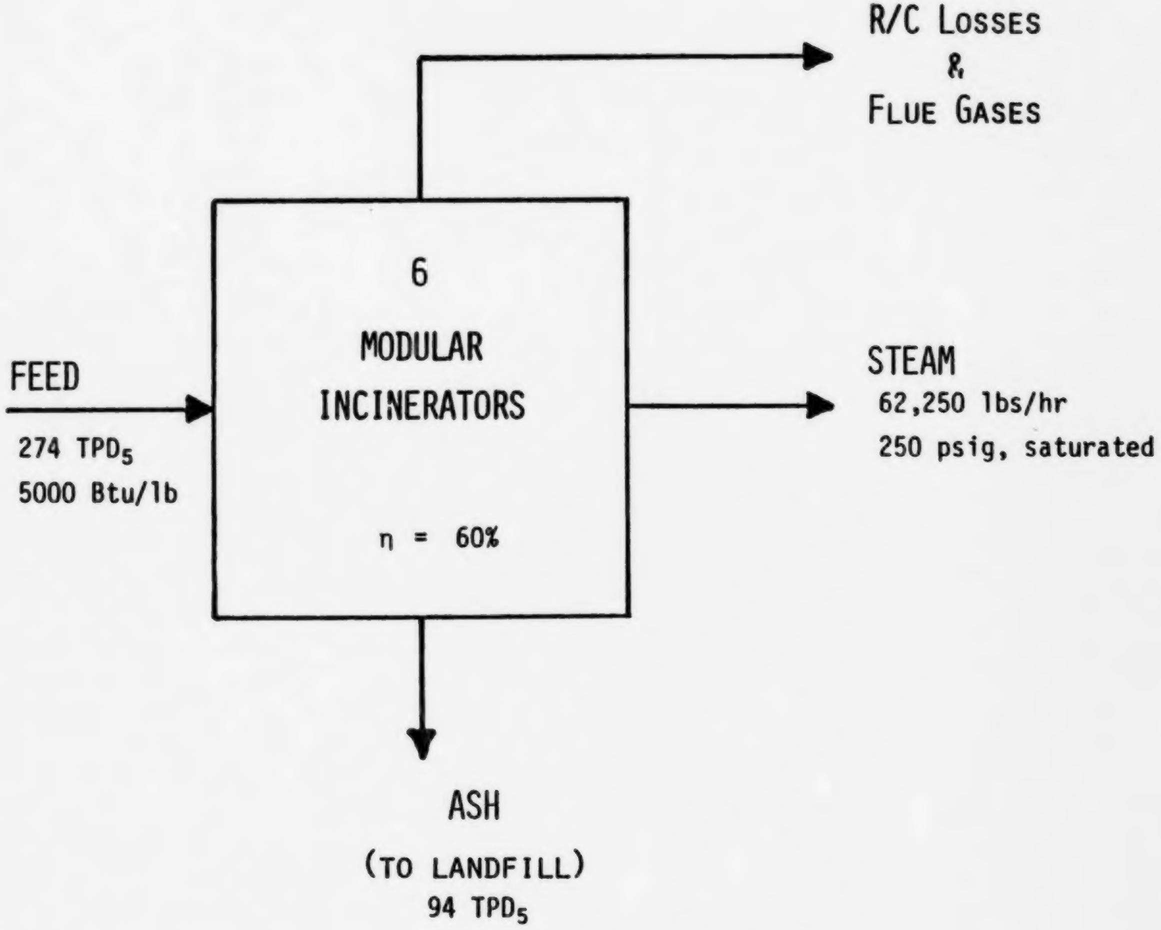
*See CSI Resource Systems, Inc., Witnessing Report For the Third EPA-Sponsored North Little Rock Facility Test, November 1978.

Figure 4.2 MODULAR INCINERATOR SYSTEM FLOWSHEET


R/C LOSSES
&
FLUE GASES
6
MODULAR
INCINERATORS
FEED
274 TPD_5
5000 Btu/lb
η = 60%
STEAM
62,250 lbs/hr
250 psig, saturated
ASH
(TO LANDFILL)
94 TPD_5

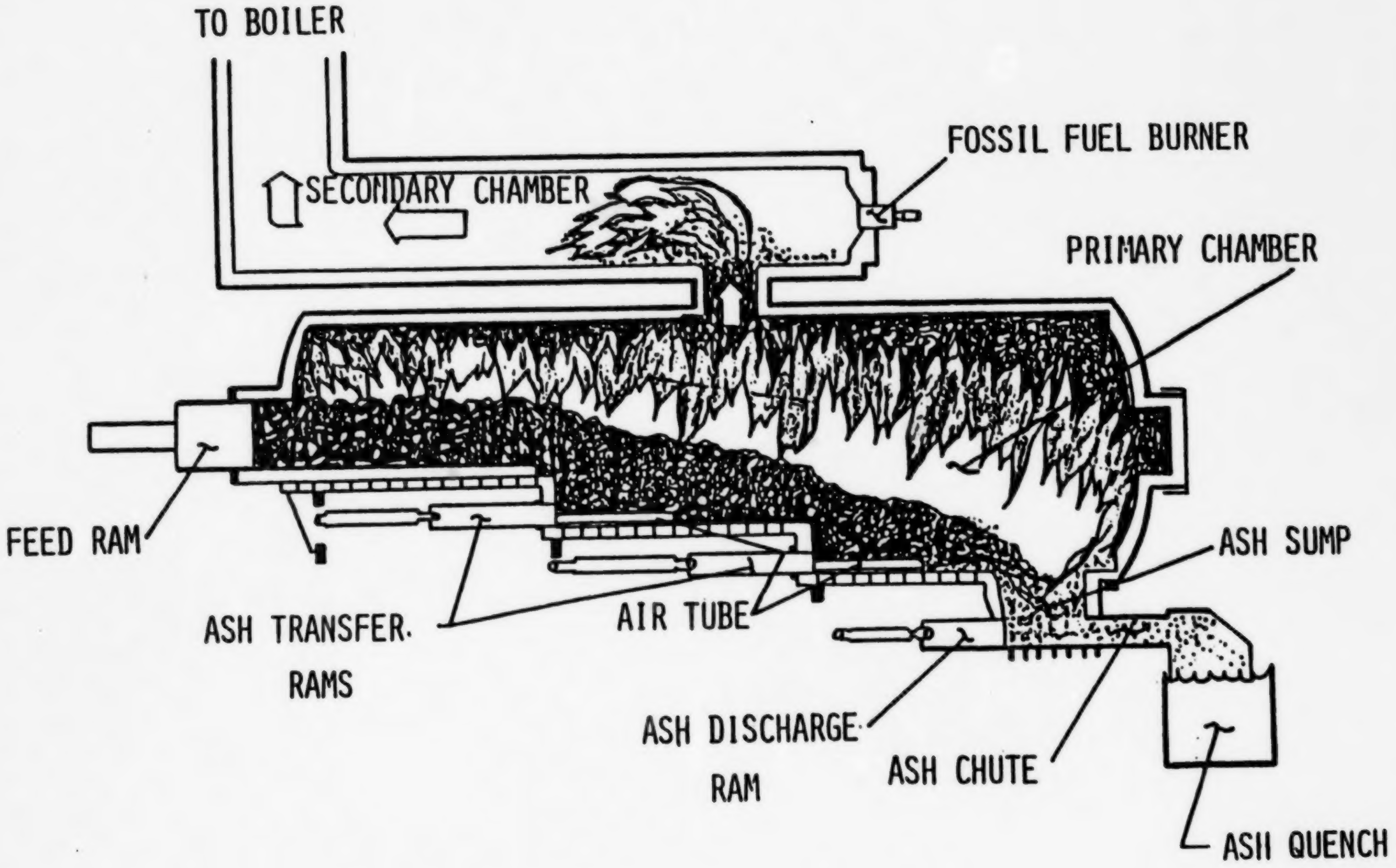

TO BOILER
SECONDARY CHAMBER
FOSSIL FUEL BURNER
PRIMARY CHAMBER
FEED RAM
ASH SUMP
ASH TRANSFER. RAMS
AIR TUBE
ASH DISCHARGE RAM
ASH CHUTE
ASH QUENCH

Figure 4.3 Cross Section Through a Typical MSW Continuous Starved Air Combustion Unit

This ash rate represents a 66 percent weight reduction across the system. There is no recovery of materials from this process. Using this system, only about 105 TPD_5 of material (ash plus carpet) has to be landfilled. This extends existing landfill life by approximately 6 to 7 times.

The detailed cost summary for the facility comprising modular combustion units with waste heat boilers is in Appendix B. It has been assumed that the facility would be financed with revenue bonds bearing on the average a rate of interest of 7 percent. Principal and interest would be paid back over a 20-year period, but interest would be paid during the assumed 2-year construction and start-up and testing period. With an estimated 1984 capital cost of $9.5 million (includes site acquisition, construction and equipment, engineering and contractor costs, and start-up and other miscellaneous cost), the estimated size of the revenue bond issue is approximately $11.4 million. Annual debt service on the bond issue is estimated to be $1.1 million. Annual O&M costs for the energy recovery facility in 1984 are estimated to be approximately $1.4 million and the aggregate total annual costs are estimated to be nearly $2.5 million. Annual O&M costs include a total labor force of 16 persons for a three-shift per day operation, as well as a residual disposal cost of $333,900, a fee to a private operator of the facility, equipment depreciation, etc.

Revenues from the sale of steam in 1984 are estimated to range from a low of nearly $1.8 million to a high of nearly $2.0 million, depending upon the sulfur content of the fuel oil being displaced. For purposes of analysis, fuel oil with a sulfur content of 2.2 percent and 1.0 percent was used. The higher the sulfur content the lower the revenues, and vice versa. Based on a May 1979 price at Charleston, South Carolina for No. 6 oil of 40.5¢/gallon with 2.2 percent sulfur, and 45.2¢/gallon for 1.0 percent sulfur, and an assumed boiler efficiency of 85 percent, the current fuel cost per thousand pounds of steam would range between $3.00 and $3.40. In 1984, it is estimated that the fuel cost would be over $5.10 per thousand pounds of steam for 2.2 percent sulfur oil and nearly $5.75 per thousand pounds for 1.0 percent sulfur oil. In 1984, it was estimated that 65,700 pounds of steam per hour would be sold for 20 hours per day, 260 days per year.

While the net disposal cost for the steam facility (after deducting steam revenues from total annual costs) is estimated to range from a high of $9.50 per ton to a low of $6.70 per ton, it is important to look at total system disposal costs inclusive of landfill operations. As was the case for the RDF facility analysis, it has been assumed that a new landfill meeting EPA Landfill Guidelines would be established and in operation by 1984. Acreage requirements for a landfill with a 20-year useful life would be somewhat less than that required to handle 1984 solid waste tonnages generated within the County, but excluding the residential and commercial solid waste generated within Rome. With a steam-generating facility the aggregate annual tonnage of solid wastes to be disposed at a landfill would be less than half the combined tonnage of the County and City (48,800 TPY vs. 97,950 TPY). The new landfill needed for residual and non-processable wastes disposal should result in some savings (an estimated $258,300) in debt service and annual O&M costs compared to those for a joint County-City landfill operation involving no resource recovery facility. (See Appendix B.) The 1984 total annual cost for a landfill operation in conjunction with a steam production facility is estimated to be somewhat in excess of $1 million. Of this annual cost, $333,900 is estimated to be paid for by the steam plant for the disposal of residuals. Thus, the 1984 net cost for landfill operations is estimated to be $696,300. As was done in the analysis for the RDF facility, a credit has been attributed to the steam-generating facility which is comprised of the total annual savings in landfill operation plus the contribution to annual landfill costs made by the steam facility for residual disposal. As a result, the 1984 net system disposal costs (after deductions of steam revenues and the landfill credit) are estimated to range from a high of $814,000 ($8.30 per ton of solid waste generated in the Rome-Floyd County area) to a low of $696,000 ($7.10 per ton).

c. Site selection--In discussing alternative technologies, it is important that the question of plant location be addressed. In general, solid waste processing plants should be located near centers of solid waste generation to minimize haul costs, and should be accessible by major roads, thus minimizing the environmental impacts due to truck traffic. In addition, truck traffic through residential areas should be kept to a minimum. The site should be industrially zoned, and public utilities should be available at reasonable installation costs. Accessibility to markets is also necessary. A plant producing steam should be as close as possible to the buyer's facility in order to avoid large steam transmission losses and costs. It is not possible to site an RDF facility on the Georgia Kraft property, since not enough land is available; therefore, the plant should be centrally located in order to minimize haul costs from collection routes and County container locations, and have ready access to truck routes servicing Georgia Kraft. These criteria could be met by siting the plant in the western section of Rome, where it would be convenient to haulers delivering solid waste.

It appears that siting a steam-generating facility within economic steam transport distance of the General Electric plant may be difficult due to surrounding land-use patterns. However, more detailed investigation is required before concluding that this recovery option option is not technically viable. In addition, it will be necessary to definitively determine the real interest of General Electric or other potential steam buyers in entering into a long-term steam purchase agreement as well as to obtain more detailed technical data, such as steam load profile, seasonal variations in steam demand, and cost of producing steam.

2. New Landfill--The opening of a new sanitary landfill represents another option for handling the solid waste disposal problem in Floyd County. Preliminary review of soils, environmental, and land-use maps suggests that considerable vacant acreage possessing soils having permeability characteristics (Allen, Etowak, and Rome soil associations) suitable for a trench sanitary landfill operation exists within the County, especially in the southwest and southeast sectors of the County. A screening of County maps also indicates that the acreage within these two sectors is not prone to flooding, do not appear to impinge upon environmentally sensitive areas, and do not contain fault lines. While the southeast sector appears to contain fairly extensive residential development along major road frontages, large interior tracts of vacant suitable land do exist. The southwest sector between Cove Springs and Booze Mountain Road appears considerably less developed along the road frontage--hence may permit easier access to a site of sufficient acreage located

away from major road frontage than in the southeast sector. In addition to these two sectors, there is extensive suitable vacant acreage to the west of Rome and south of the Coosa River, and in a sector running east by northeast of the City. Because the latter sector has substantial amounts of residential development, there may be less opportunity to locate a site in this sector, despite considerable interior tracts of vacant land suitable for a new landfill.

In determining the location of a new landfill, transportation from the end of collection routes and from the 70-cubic-yard container locations must be taken into account, in order to determine the best system cost solution to disposal. The analysis of haul cost to either a new landfill or an energy recovery facility was outside the scope of this study. However, a few observations are presented on what might be anticipated in terms of changes in transportation costs compared to the exising system. Some judgments also are offered on differences in transportation costs between a new landfill option and an energy recovery option.

Compared to the existing landfill/cubic-yard container system, it is doubtful that a new landfill could be located so as to result in no increase in the present system transportation costs. This increase in incremental cost is especially likely to be true for any new landfill which also services the City of Rome. Depending upon the specific sector in which a new landfill is located and the difference in haul time to it compared to the existing landfills, it might be necessary to construct a transfer station for the City of Rome in order to economically service it by a single new landfill.

While it can be anticipated that there will be some increase in transportation costs for a new landfill compared to the existing location of landfills and 70-cubic-yard container locations, it seems possible that such an incremental cost might be greater than that associated with the location of an RDF or steam-generating facility. For example, it seems reasonable to expect that an RDF processing facility located in an industrially zoned area in south, central Rome would result in an overall transportation cost saving to the City compared to the haul costs to either the City's existing landfill or to a new landfill. In the case of the County, however, it is not apparent that transportation costs to a centrally located RDF facility necessarily would be less than present, and for some geographic sectors might be slightly higher. On net, it does appear reasonable to anticipate a somewhat lower haul cost for an energy facility which is centrally located, than for either of the two landfill alternatives. As fuel costs are anticipated to rise rather substantially over the next couple of years, any reduction in overall mileage travelled by rolling stock (private and public) will make a significant contribution to disposal system economics.

The investigation of the disposal option involving a new landfill considered two alternatives. The first alternative considered was the acquisition and development of a single new sanitary landfill comprising a 250-acre site, of which half would serve as a buffer area. This new sanitary landfill would have capacity to handle the combined solid waste generated by the City and County for about a 20-year period. The acquisition, development and operation of this large new landfill was assumed to be a cooperative venture by the County and City, based upon an interlocal agreement. The development and operation of the new sanitary landfill was assumed to conform with the proposed EPA Landfill Guidelines. These Guidelines are expected to become final by the end of 1979, and within the next few years to be incorporated into Georgia (and all other states') regulatory requirements for the design and operation of sanitary landfills. In addition, it was assumed under the open dump inventory to be initiated this summer by the State in conformance with Section 4005 of the Resource Conservation and Recovery Act of 1976, that the County's landfill at Berryhill Road and the City's landfill would not qualify as a sanitary landfill; hence require upgrading during the next 5 to 6 years under a compliance schedule issued by the Georgia Department of Natural Resources. Upgrading is anticipated to involve capital expenditures for leachate control, treatment, and monitoring; methane gas control and monitoring; and control of rainwater surface runoff, as well as significant increases in operating and maintenance costs. As a result, it was assumed that both County and City would opt to open by 1984 a new conforming sanitary landfill and close the existing landfills rather than expend substantial funds on facilities whose remaining capacity is relatively limited.

The second alternative considered was the acquisition, development, and operation of two new sanitary landfills: one for the County and one for the City of Rome. The new County landfill would involve a site of 150 acres, and the City's new landfill would be approximately 90 acres in size. For both new landfills about half the acreage would serve as a buffer zone. Both landfills should provide long-term disposal--approximately 20 years--and conform to the proposed EPA Landfill Guidelines.

For each alternative, a summary of cost estimates for 1984 and estimating assumptions are found in Appendix B. The cost estimates for a single new landfill, cooperatively developed and operated by the County and City, and the cost estimates for two new landfills are summarized in Table B-10. In the case of a cooperatively operated landfill, the net disposal cost for the first full year of operation (1984) is estimated to be $13.00 per ton. In contrast, two new sanitary landfills are estimated to have net disposal costs significantly greater than that for a single new landfill because of the unnecessary duplication of equipment, manpower, and incremental costs (capital and operating) of meeting the EPA Landfill Guidelines at the two sites. For the County the net disposal cost for the first full year of operation (1984) is estimated to be about $17.40 per ton, while for Rome the net disposal cost is estimated to be about $25.00 per ton. Thus, it can be concluded that a cooperatively developed sanitary landfill alternative would provide the lowest disposal cost among the landfill alternatives. It is important to recognize that the cost estimates are budgetary and could be higher, depending upon the particular design factors which would have to be incorporated for a specific site to conform to state and RCRA requirements.

When coupled with the likelihood that haul cost to a disposal facility probably favors an energy recovery facility over a new landfill, it appears reasonable to conclude that energy recovery and landfilling are economically competitive. Since an energy recovery facility, particularly a centrally located RDF facility, is likely to generate less siting and development issues than a new landfill, the County and City would seem warranted in vigorously pursuing implementation of an energy recovery project.

3. Summary of Options--The results of the examination of the solid waste options available to the City of Rome and Floyd County are summarized in the following table:

TABLE 4.1

SUMMARY OF SOLID WASTE MANAGEMENT OPTIONS
(1984 Dollars)

	Resource Recovery		New Sanitary Landfill		
	RDF	Steam	Joint	County	City
Total Solid Waste TPY, 1984	97,954	97,954	97,954	63,166	34,788
Processable Waste TPY, 1984	74,874	74,874	NA	NA	NA
Capital Cost ($000)	$8,382	$11,383	$3,455	$2,916	$2,213
Annual Facility Cost ($000)	$2,330	$ 2,468	NA	NA	NA
Landfill Annual Cost ($000)	$ 647	$ 696	$1,271	$1,097	$ 877
Less: Energy Revenues ($000)	$590-$1,296	$1,754-$1,962	NA	NA	NA
Less: Landfill Savings Credit ($000)	$ 641	$ 592	NA	NA	NA
Net Disposal Cost ($000)	$1,725-1,020	$814-$696	$1,271	$1,097	$ 877
Net Disposal Cost per Ton	$17.60-$10.40	$8.30-$7.10	$13.00	$17.40	$25.00

Note: See Appendix B for detailed cost estimates and assumptions.

As noted in the preceding discussion, there are good reasons for expecting that the disposal cost differences between energy recovery (especially a RDF facility) and a new sanitary landfill to be significantly less than portrayed in the summary table. Given the fact that there is an estimated remaining life at the Berryhill Road landfill of only 7 years, time is of the essence with respect to a decision on which disposal option to pursue. Somewhere between 4 and 5 years will be required to implement any one of the options selected.

While it is estimated that there are at least 10 years of remaining capacity at the City's landfill, in a basic sense this is misleading. This is because the County is currently providing the City a valuable service by accepting at its landfill all of the solid waste generated by industry located within the City limits. In the absence of this County service, it is reasonable to conclude that Rome and Floyd County equally face a relatively short time horizon in which to decide upon and implement a disposal option. Thus, the City needs to assume greater participation in, and share in the responsibility for, selection and implementation of a disposal option.

An energy recovery project is not economically justified without the City's commitment and active participation in its implementation. Similarly, the County faces a dilemma in choosing a landfill option without the City's active involvement, since it cannot choose the least cost landfill alternative for all residents and businesses within the County without a speedy decision from the City on its commitment to a cooperative venture.

While the City quite correctly wants to keep its disposal costs as low as possible, this could be accomplished if the County paid for site acquisition. Only in 4 to 5 years would the City have to begin to expend funds for its share of site development and equipment purchases--about the same time horizon in which it would have to contemplate expenditures for site acquisition plus development and equipment outlays, should it decide to go it alone.

This time framework also would be about the same for an energy recovery facility. In this case, the City's annual disposal cost could be expected to be proportional to the tonnage of processable waste contributed to the recovery facility. Presumably either the County or an Authority would be responsible for the O&M costs associated with landfilling non-processable solid wastes (brush, construction debris, and carpet trimmings); the cost of which could be covered by a user charge, as has been assumed in the economic analysis for the disposal cost of residuals from an energy recovery facility.

In summary, both Rome and Floyd County are confronted by the need to work together in solving their mutual solid waste disposal problem. Time is of the essence in making a decision on the preferred option. From an economic point of view it appears that energy recovery should be reasonably competitive with a new landfill, but from a siting point of view it should be more advantageous than a new landfill. In addition, the energy recovery option would substantially reduce the volume of solid waste to be landfilled. While a recovery facility would not eliminate the need for a new sanitary landfill, it would result in substantially less acreage being required to meet solid waste disposal needs over a 20-year period.

V. LEGAL AND INSTITUTIONAL CONSIDERATIONS

The purpose of this section is to discuss some of the legal and institutional factors which will need to be jointly considered by the City of Rome and Floyd County in deciding whether to proceed with implementation of a recovery project, and if so decided, how to achieve successful implementation.

A resource recovery facility is essentially a manufacturing plant which uses as its feedstock the discards of society to produce valuable products (energy and materials) to the specifications of buyers. Public sponsorship of a manufacturing business is a new activity for state and local governments. The risks and uncertainties attendant with this new endeavor must be appropriately managed by the public. Existing laws, regulations, and their judicial interpretation, however, affect the ability of the public to manage risks and uncertainties associated with the implementation of a resource recovery project.

Three aspects of a recovery project require a legal framework designed to permit effective and efficient implementation and long-term operational success. These three aspects are:

- Waste Supply Control - Waste supply is the feedstock required to produce marketable products. Revenues from product sales help lower the disposal cost paid by solid waste generators (households, businesses and industry). A project has poor economics and doubtful financing without control over the delivery of solid waste to the resource recovery facility.

- Procurement - Sponsors need freedom to be able to choose from A&E, turnkey and full service approaches in order to manage risks associated with systems performance, sale of products, economics and financing.

- Marketing - The location and required specifications of energy buyers affect the choice of technology, size of plant, and the capital and operating cost of the recovery facility. Sponsors should be free to select that energy buyer who offers the best long-term benefit to the project, and negotiate a contract for the sale of energy.

Unfortunately the "public" sponsor of a recovery project is in reality not a single decision-making entity, even though it may be a city, county, or special authority. At the least complex level a city council, mayor/city manager, tax payers' association, neighborhood group, public works department, board of health, legal department, zoning board, the private waste haulers, and so on comprise the decision-making entity, which in turn must interact with various agencies and individuals at the State level and frequently the county level. In the case of the interest of the City of Rome and Floyd County in co-sponsoring a recovery project, the number of actors and their interaction are compounded, which in turn could potentially contribute to the complexity of project implementation unless an appropriate institutional framework is available or created.

Aspects of a recovery project affected by institutional factors are:

- Location of Recovery Facility Site
- Project Sponsorship
- Project Ownership
- Project Financing
- Waste Supply Control
- Procurement

Legal and institutional factors are, obviously, closely interrelated. As a result, in much of the discussion which follows there will be an intermixing, or blurring, of legal and institutional factors; some aspects identified above will be discussed together because they are so closely interdependent. Thus, the succeeding discussion begins with a simultaneous description of project sponsorship, ownership, procurement, and financing because the key legal/institutional framework was provided by the Georgia Legislature with passage of Act 1364, which created Code Chapter 69-15a: Resource Recovery Development Authorities Law.

A. Project Sponsorship, Ownership, Procurement and Financing

Under Code Chapter 69-15a, the Georgia Legislature established in every municipal corporation and county of the state a Resource Recovery Development Authority. A municipal corporation and a county may together form a "joint resource recovery development authority." This Authority, however, may not transact any business or exercise any powers until the governing authorities of the local units of government involved (i.e., Rome City Commission and/or Floyd County Board of Commissioners) perform the following:

- By ordinance or resolution declare the need for an authority to function.
- Authorize the chief elected official to enter into an agreement with other units of local government for the activation of an authority.
- Execute an interlocal agreement for that purpose.
- File a copy of the executed agreement with the Secretary of State.

Control and management of an Authority is vested in a board of directors comprised of five members appointed by the governing authority of the local unit of government activating the Resource Recovery Development Authority. In the case of a joint authority, the City of Rome would appoint two members, Floyd County two members, and the fifth member would be appointed by the four. A chairman and vice-chairman must be elected by the directors from their own membership, but they can elect to appoint non-board members as secretary and treasurer.

1. Procurement--Resource recovery development authorities have been given complete freedom with respect to the acquisition of a system and its operation. Both the authority and municipal corporations participating in activities of the authority may enter into contracts or lease agreements for a period not exceeding 50 years. It appears that an authority does not have to bid competitively the design, construction, or operation of a recovery project, and can

enter into a negotiated procurement for any of the above aspects of project implementation. This means that an authority could negotiate the procurement of a facility from a single system vendor on a turnkey basis with a long-term operating contract. Except for actual ownership, such a procurement represents a full service approach and would permit the maximum transfer of risks and uncertainties from an authority to a system vendor with respect to five key project risks:

- Changes in waste quantity and composition;
- Systems performance including product quality, recovery efficiency, processing capacity, reliability, and ultimate residuals disposal;
- Marketing of recovered energy and materials including changes in user requirements and product prices, and length of contract period;
- Project economics, especially lifetime operating and maintenance costs; and
- Financing, especially the amount and cost of financing, the marketability of bonds, and actions of a bond trustee.

Table 5.1 below summarizes the degree to which the five key areas of risk and uncertainty can be transferred to private industry according to the three methods of procurement:

- A&E is the customary architectural and engineering contract for facility design and equipment selection, preparation of competitive bid specifications, construction supervision, and (possibly) facility shakedown. Construction and equipment installation is competitively bid. Full-scale operations (and possibly shakedown) is the responsibility of the public owner.
- Turnkey involves a single entity performing the services provided by A&E plus construction and testing and shakedown of the system. Payment is made to the turnkey contractor following successful shakedown and acceptance by the public sponsor. Full-scale operation is the responsibility of the public owner.

- Full service involves a single contractor, who performs all functions of a turnkey contractor plus the responsibility for full-scale operations of the facility (generally ranging from 5 to 20 years).

TABLE 5.1

	Degree to which risks can be transferred to private industry if the procurement method is:		
KEY PROJECT RISKS	A&E	TURNKEY	FULL SERVICE
PROJECT ECONOMICS	NONE	LIMITED	SUBSTANTIAL
FINANCING	NONE	LIMITED	SUBSTANTIAL
MARKET	NONE	NONE	SUBSTANTIAL
SYSTEMS PERFORMANCE	VERY LIMITED	LIMITED	SUBSTANTIAL
WASTE STREAM	NONE	NONE	LIMITED

While a full service procurement offers the greatest opportunity for transferring risks, an authority could elect to use either an A&E or turnkey-only approach. In part, the choice would depend upon the risk posture of an authority. That is, the choice would depend upon whether an authority wished to avoid risks and uncertainties, share them with private industry, or assume them. An authority's risk posture in turn would depend upon a specific identification of risks in terms of their consequences and the probability of occurrence. Such a determination can be based only upon a more thorough analysis of the technologies appropriate to the Rome-Floyd energy and materials market situation, the energy price and associated terms and condition of purchase, better cost data, and a more rigorous economic analysis of the proposed recovery project than is possible under this prefeasibility study.

2. Financing--While an authority's choice of procurement method is influenced by its risk posture, the choice also will be influenced by the concerns of an investment banker. This is especially the case under Code Chapter 69-15a authorities, since by statute they can issue only revenue bonds. The investment banker's primary concerns are that revenue bonds can be marketed and can be sold at the lowest possible rate of interest. His concern means that the investment banker looks at the various aspects (structure) of a recovery project to determine that potential buyers of bonds are assured that:

- The technology selected is sound, from an engineering perspective, and has a reasonable probability of performing according to design criteria over the life of the project.
- Adequate quantities of solid waste will be available over the life of the project.
- The operations of the facility will be performed by an experienced and qualified operator.
- Revenues from the sale of energy and materials and from the payment of tipping fees or disposal charges will at all times be sufficient to cover annual principal and interest payments and annual operating and maintenance costs--even if the facility should, for any reason, become inoperable or should operate below design capacity.

These basic considerations of an investment banker, while not dicta that must be strictly adhered to by a project sponsor, do provide a reasonable frame of reference. In terms of financing, the concerns of the investment banker tend to favor a full service (or turnkey with operating contract) procurement over A&E or turnkey-only approaches. Such a predilection stems from the fact that under a full service approach, guarantees (backed up by financial capability in the event of default) can be obtained with respect to system recovery efficiencies, processing capacity, quality and quantity of recovered energy and materials, quantity of residuals requiring ultimate disposal, product revenue guarantees and financial coverage in the event of certain kinds of defaults. These guarantees are not possible under an A&E or turnkey-only approach. Such guarantees, backed up by the assets of a single entity, are important because today all resource recovery technologies should be considered in the category of demonstrations. This is because for all of the available technologies there is insufficient, and often inadequate, operating experience in this country. Moreover, available experience in the U. S. indicates that during the first (and sometimes second) year of full-scale operation, additional modifications are required to at least part of the system, and frequently a significant additional expenditure of funds is required. A full service operator can rapidly make any additional modifications because of his intimate knowledge of the system, and he has an incentive to do so because of penalties for failure of the system to meet various performance, recovery and efficiency guarantees. Thus, existence of a full service agreement gives prospective buyers of revenue bonds greater confidence in the reliability of the system and the realization of product revenues. This financing consideration is, thus, a further reason for the City of Rome and Floyd County to implement a Code Chapter 69-15a authority.

a. Local Backing of Disposal Fees Required for Revenue Bond Financing - Though Code Chapter 69-15a specifically excludes state and local government full faith and credit backing of revenue bonds issued by a Resource Recovery Development Authority, an underwriter, in practice, is likely to require in the agreements between an authority and suppliers of waste that the latter pledge their full faith and credit for the payment of disposal fees where disposal costs are paid from property taxes. However, in the event collection and disposal costs are paid through a service charge, the underwriter will require that contracts contain a pledge by each local unit of government that the service charge levy always will be sufficient to pay the disposal fees required to balance total annual revenues and costs of the recovery facility. Local government backing of its disposal fee payment is, thus, critical to the marketing of revenue bonds, since disposal fees are a key component of a project's revenue stream. Depending upon the specific terms and conditions contained in an agreement between an authority and participating units of local government (e.g., the right of an authority to raise disposal charges immediately to cover total revenue requirements on an emergency basis and the pledge by participating units of government to give such payments first priority) and the credit rating of the participating governments, it is possible that the purchase of revenue bonds and the interest rate paid will be based solely upon the strength of the backing of disposal fees. Indeed, such was the case in the sale of bonds issued by the Connecticut Resources Recovery Authority for its Bridgeport project.

b. Take-or-Pay Provisions in Energy Sales Agreement is Essential - Revenues from the sale of energy comprises the other key revenue component of a project. For example, in projects involving the sale of both energy and recovered material, energy revenues typically account for about 85 percent of total product revenues. Among the critical components involved in an energy sales agreement are the length of the contract, commitment by the buyer to purchase a specified amount of energy, and the willingness of the buyer to pay for the energy when it is available whether he actually utilizes it or not. Sound project economics and the marketability of revenue bonds require that the energy sales agreement provide:

- A minimum purchase period of 10 years and preferably a purchase period equal to the term of the bond issue with automatic renewal periods unless notification not to renew is provided.

- A guarantee that the buyer will purchase an amount of energy sufficient to produce revenues which will minimize the burden placed upon disposal fees. The guaranteed amount, while negotiable, should be above the lowest amount consumed by the buyer on an hourly and monthly basis over a year. Related to this guarantee is that the buyer pledge to buy all the energy produced up to his maximum requirements.

- A commitment by the purchaser to buy the guaranteed amount of energy over the life of the contract is intended to protect the economic viability of the project against a substantial temporary or permanent shut-down of the buyer's plant. As a result, where the buyer is a division or subsidiary, guarantees by the parent company are critical. Normal scheduled plant closings for annual vacation and holidays are exempted from the guarantee.

In the parlance of the investment banking community, the conditions described above are known as "take or pay." While it is not always possible to negotiate true "take or pay" provisions, an underwriter/investment banker will look for provisions which approximate them in order to enhance the saleability of the revenue bonds to be issued.

It should be noted in passing that securing a take-or-pay type energy agreement is likely to involve considerable give and take between the parties to an agreement. For example, in the case where the buyer is a manufacturer an authority can expect (at a minimum) to provide discounts on the price of energy and maybe even have to agree to be subject to financial penalties (e.g., deducts from billings) for failure to deliver energy in the quantity and at the quality required by the buyer.

3. Marketing of Recovered Products--Code Chapter 69-15a appears to give a Resource Recovery Development Authority maximum flexibility in securing the sale of recovered energy and materials. Furthermore, it can enter into negotiated long-term purchase agreements. An Authority can elect to negotiate directly the sale of energy and/or materials. It also can elect to have a full service vendor assume the responsibility for marketing recovered products. The latter approach has the advantage that an Authority can require and receive product price or revenue guarantees, including a sharing of revenues above those guaranteed, from the full service vendor. As a result, some protection can be provided against cyclical drops in product prices, as well as against a failure of the system to meet vendor guarantees of recovery efficiencies for products. It should be pointed out, however, that an energy buyer may be unwilling to negotiate a purchase agreement with anyone but the public sponsor of a recovery project. While many factors are involved in such a position by a prospective energy buyer, it is suspected that one reason for this occurring is that the buyer anticipates being able to negotiate a more favorable price than if he had to deal with another member of the private sector. Thus, an Authority should be prepared to assume responsibility for the marketing of recovered products, especially energy.

4. Issues To Be Considered In Establishing An Authority--A number of factors require resolution prior to activating a Resource Recovery Development Authority under Code Chapter 69-15a. First and foremost among these factors is determination of who shall take responsibility for activating, organizing, and providing interim operating funds for an Authority. Closely related to this determination are decisions about whether an authority should be activated and when it should be activated. For purposes of discussion, the above cited factors will be more or less dealt with in reverse order.

a. Should An Authority Be Activated - The conclusion of the pre-feasibility work is that the City of Rome and Floyd County should proceed to undertake a full-scale feasibility effort with respect to:

- Production and sale of RDF to Georgia Kraft, or
- Production of steam for sale to General Electric or possibly to enhance development of an industrial park.

If the City of Rome and Floyd County concur in this conclusion and agree to proceed with a feasibility effort, then an Authority should be activated. This is proposed because the indications are that all the factors required for a viable project exist, and that it can be implemented (if so desired by the City and/or County). Thus, the decision to proceed with feasibility really represents a commitment to undertake a project, providing nothing is uncovered which would make it economically unacceptable.

Given this premise, an Authority represents the best vehicle for implementing a recovery project for the following reasons:

- It has great latitude in choice of procurement approach compared to the City or County, and provides the only means of entering into long-term contract with system vendors/operators and buyers of recovered products essential to successful project implementation.

- The statutory design of the Authority provides it with maximum flexibility for carrying out a resource recovery project and for entering into joint venture relationships with private enterprise (a highly desirable feature) to achieve an important public purpose.

- It offers tax exempt revenue bond financing at potential rates of interest only slightly higher than General Obligation bonds without (necessarily) affecting the debt ceiling and credit rating of the participating unit of local government.

- It provides a vehicle for all participating units of local government to directly affect the management of project implementation through membership on the Board of Directors.

- Responsibility for management and the success or failure of the planning and implementation aspects of a project are placed in an entity having no other responsibilities, which would not be the case if either the City or County assumed resonsibility.

- It provides a vehicle for attracting and developing a highly qualified and experienced staff at commensurate salary scales which might be difficult, if not impossible, to achieve by the City or County.

The major disadvantage is that an Authority has no automatic source of funds with which to conduct its business. This is a disadvantage only from a purely administrative perspective. From the perspective of the City and County, this is an advantage, as it gives them budgetary control over operations if they provide most or all of the interim funding needs from their own budgets. However, as discussed later, funding the operating requirements of an Authority does not appear to be a simple matter, and may require considerable ingenuity to resolve.

b. When Should An Authority Be Activated? - If the City and County are serious about proceeding with full-scale feasibility investigation of an energy recovery project, then it would be desirable to activate an Authority sufficiently early so that it can be responsible for the management of the effort. This means that several months must be allowed for the Authority to become organized and to recruit and hire at least an executive director to assist in structuring the work to be done and in preparing an annual operating budget. Such a time period is predicated upon the assumption that the Authority (and the City and County) would rely almost entirely upon consulting services to carry out the feasibility determination. It should be noted that the development of a scope of work as a condition for receipt of a grant under the President's Urban Policy programs should provide a reasonably comprehensive view of the activities and key decisions required to proceed with planning and implementation of a recovery project. The identification of activities and key decisions provide a framework in which an Authority can be made operational, should that be the decision of the City and County.

c. Who Should Activate An Authority? - Serious consideration should be given by the City of Rome and Floyd County to jointly activate a Resource Recovery Development Authority. There cannot be a viable and successful energy proejct without the wastes generated from both units of government. The facts of the situation are such that the City cannot be a passive partner to the undertaking of a resource recovery project. It must contractually commit to deliver the solid wastes which it collects to a recovery facility. It must, through its permitting power, require the private hauler of commercial wastes to dispose at the recovery facility. It must cooperate with the County in seeing that private haulers of solid wastes from industry located in the City which are acceptable (processable) are delivered to the recovery facility. It has a real stake in the price and terms and conditions of an energy contract, and in the capital and total annual costs of a recovery facility because these affect the disposal fee which it will have to pay. And it should have a real interest in seeing that an energy recovery project is successfully implemented and operated, since this will contribute to the economic base in terms of employment and disposable income. For similar reasons the County must be an active participant. Active participation can be realized through joint membership on the board of directors of a Resource Recovery Development Authority. Such membership has a further benefit in that the respective governing authorities of the City and County can be kept fully informed and made extremely knowledgeable about what is happening, and, as a result, have full understanding of the reasons behind the kinds of contractual commitments each will be asked to approve.

d. How Should An Authority Be Organized and Funded? - Under Code Chapter 69-15a an Authority must have a five-person board of directors who are appointed by and serve at the pleasure of the governing authority of the unit(s) of local government activating an authority. As previously pointed out, Code Chapter 69-15a specifies that where an authority is jointly created by two units of local government each shall appoint two members who reside within the jurisdiction of the appointing governmental entity. Those four, in turn, shall appoint the fifth member. Directors may be appointed, and reappointed, for a term of four years. Because directors are responsible for the overall management of an Authority, initial terms of office for the appointees probably should be staggered so that continuity in management will be provided. Directors initially appointed with terms of office less than four years could then be reappointed for a four-year period upon expiration of their initial term of office.

Selection of directors should take into account the diversity of activities and expertise that will be involved in the planning, implementation, and operation of an energy recovery project. Business, technical, financial, and political acumen will be required. It also will be important that some of the directors have considerable influence and prestige with the civic, business and/or political communities within Floyd County as well as at the state level of government.

While legal matters will be extremely important, the necessary expertise probably can be best provided through a combination of part-time assignment of either City or County legal staff and an outside legal counsel rather than through appointment of a lawyer to a board of directors. Experience to date indicates that outside legal counsel is needed because most of the legal and contractual aspects of systems procurement, especially where full service is involved, and energy sales agreements requires knowledge of, and experience in, corporate law and the related understanding of corporate financing and Internal Revenue Service Codes and Regulations.

In deciding to activate an Authority, the City and County will need to set a budget for the first year and to decide upon where the funds will come from. Critical to establishing a budget and its funding will be:

- Delineation of the scope of activities to be undertaken and an allocation of responsibility for their performance between Authority staff and outside consultant service.
- Determination of the number of professional and support personnel, and a description of the duties and responsibilities of each.

Clearly, a major activity during the first year will be to begin work on project feasibility. In order to maintain the momentum which has been created as a result of the City's and County's joint request for technical assistance from the U. S. Environmental Protection Agency, primary reliance for the conduct of the feasibility work probably should be placed upon an outside consultant, with most of the technical support of the consultant activity provided jointly by the City and County rather than from Authority staff. Such a proposed arrangement is based upon two considerations. First, considerable time is likely to be spent by the directors on recruitment and hiring of a person possessing the necessary qualifications and experience to serve in the capacity equivalent to an executive director. Second, contributions of staff time by the City and/or County can be accomplished within existing budgets, thus minimizing actual dollar requirements of the Authority.

How an Authority's budget requirements should actually be funded is not clear. By statute an Authority has no independent revenue sources. It can borrow money for corporate purposes and receive loans, gifts, and grants. It can also issue notes in anticipation of the issuance of revenue bonds for a project. Code Chapter 69-15a, however, states that obligations of an Authority, other than revenue bonds, "shall be payable from the general funds of the Authority and shall not be a charge against any special fund allocated to the payment of revenue bonds..." In the absence of a project, the problem is how to create a general fund. Since an Authority will possess little in the way of tangible assets at the time of its organization, and there exists some uncertainty as to whether a project will be financed (the proceeds of which could include provision for the costs of consulting services), some ingenuity appears needed in order to enable an Authority to borrow from a bank. The City and County should determine whether they have the authority to loan or contribute funds to a public purpose entity such as a Resource Recovery Development Authority.

Both the Environmental Protection Agency and the Department of Energy have grant programs which could be used to finance most of the cost for project feasibility work and provide a source of funds to help staff the Authority. However, resort to either of these programs involves significant limitations:

- Both require local financial participation, with the EPA program being the more restricted of the two in that grants specifically are limited to 75 percent of the cost, and of the local 25 percent share, one-third of the contribution is expected to be in actual dollars, not services in-kind.

- Both grant programs are based upon a national competition held once a year. The earliest the next DOE program announcement is likely to be issued is this coming summer.

- Both grant programs will restrict the amount of funds provided to the cost for a specific phase of implementation work comprised of a discrete number of tasks producing specific results of a go-no/go decision.

Because of the above limitations, financing the operations of an Authority should not be based solely upon Federal grants.

The City and County may wish to consider a more radical approach to providing operating funds to an Authority. Essentially this would involve having the Authority take over the ownership and operating responsibility of City and County landfills. Transfer to the Authority of the landfills and equipment could be accomplished by purchase through issuance of revenue bonds by the Authority, or through a gift of the sites and purchase by the Authority of equipment at its depreciated value. The latter approach would have the advantage of reducing the debt service which would have to be charged by the Authority. Under such an arrangement an Authority could contract with the City and County for actual operation, but would be in a position to establish a uniform gate charge, such as that recommended in the *Solid Waste Management Plan For Floyd County and The City of Rome*, issued in October 1974 by the Coosa Valley Area Planning and Development Commission. The advantages of such an approach are several. First, the actual operating costs for the landfills could be eliminated from the City and County budgets, hence their respective tax rates. Payment to the Authority of the gate charge by the City and County would be returned (with the exception of a debt service fee and a small administrative fee retained by the Authority) to them under the operating contracts with the Authority. Business, industry, and those County residents not receiving public collection services would pay the gate charge directly, with most of those proceeds being returned to the City and County under their respective operating contracts. Under Authority ownership of the landfills both the County and City--especially the latter--might want to consider instituting a fee system for collection-disposal services, and thus remove all solid waste management activities from the tax rate.

Second, Authority ownership of the landfills would permit the Authority to tack on an administrative fee to a gate charge. Such a fee could provide it with a significant source of operating funds after allowance for costs associated with billings and collection of the gate fee and administration of the operating contracts with the City and County.

Third, Authority ownership of landfills would place it in a stronger position to control where solid wastes are disposed, especially in negotiating agreements with private haulers for delivery of wastes to its resource recovery facility. In part, this could be accomplished through higher gate fees at landfills than at a resource recovery facility. Ownership by an Authority would not, however, alleviate responsibility by the County for assisting the Authority in establishing and maintaining control over where solid wastes are disposed within the County and to enforcing prohibitions against illegal dumping.

In conclusion, while the financing of operating costs of an Authority is not a simple matter, there are a number of possible approaches available which the City and County could utilize when they institute activities to set up an Authority. Each approach requires further investigation. In the end, mutual agreement between the City and County on the method, or methods, of funding an Authority will be required.

B. Waste Supply Control

A resource recovery project is dependent upon a known and reliable supply of solid waste. Without a known and reliable supply a project's economic viability is extremely uncertain. In order to assure the necessary supply of solid waste, those responsible for its collection must commit to deliver all that is collected to a recovery facility. Achieving this commitment is relatively easy where all solid waste is either collected by local government, or private collection is controlled through public bid procedures or franchises. Neither of these conditions are true for the Rome-Floyd area. In addition, the power to direct solid waste to a recovery facility can be complicated by the existence of private recycling operations. Moreover, the nature of local government commitments is influenced by the concern that an investment banker has that any revenue bonds issued for a project are highly saleable. These issues of waste supply control will be discussed in more detail in the following subsections.

1. Directing Solid Waste To A Recovery Facility--The power to establish that solid waste be disposed of at a particular landfill or proposed recovery facility does not appear to exist in the Rome-Floyd area. While the City does control, administratively, where City collection vehicles deposit solid waste, it does not control where private haulers of commercial and industrial solid waste dispose, except in a negative sense for industrial wastes. For the area outside the City limits, Floyd County has little control over the disposal of solid wastes. On the average, about 17 percent of the household wastes generated within the County (outside of the City limits) are collected by the County through the strategic placement of four 70-cubic-yard containers (based on data for first half of 1978). None of the commercial and industrial waste is under the control of the County. In aggregate, the City and County currently control administratively about 44 percent of the total solid waste generated within the County (including Rome). Thus, without the power to direct individuals and private haulers to deliver their waste to a resource recovery facility, a project cannot be implemented. This power will be crucially needed if there is a disposal fee charged for delivery of wastes at a recovery facility--unless the City and County pay this cost out of their general revenues--since individuals and private haulers otherwise may be tempted to dispose of their solid wastes illegally or out of the County to avoid payment.

There are two distinct, but interrelated, sets of issues involved in assuring a known and reliable supply of solid wastes for a recovery facility. One set of issues involves commitments by the City and County. The other set of issues involves the power by the City and County to direct individuals and private haulers to deliver wastes to a recovery facility.

a. Public Commitments and Guarantees by the City and County - Delivery of solid wastes under the control of the City and County will be a keystone to successful implementation of a recovery project. These commitments and guarantees can be expected to be expressed contractually (irrespective of whether the project sponsor/owner is an authority, the County or even the City) if financing is done through revenue bonds. Should the County or City opt to be the sponsor/owner and use general obligation bond financing, it would still be in their best interest to have a contract whereby the other party commits itself to guarantee delivery of a specified tonnage of solid waste on a monthly basis. In the case of revenue bond financing, an additional guarantee can be expected to be required by an investment banker. The investment banker will want what is known as a "put or pay" agreement. That is, not only must there be an agreement guaranteeing delivery of a specified tonnage, but there must also be a guarantee to pay for that specified tonnage even if there is a shortfall. If the disposal fee is paid from general revenues, then there must be a pledge that the disposal fee will be given preference over other obligations. The system vendor/operator will also want a put-or-pay type agreement. In addition, the vendor/operator may also want the right to add a premium to the disposal fee if actual tonnage delivered exceeds by a certain percentage (e.g., 10 percent) the guaranteed tonnage. This is because the excess tonnage could exceed the processing capacity of the system and dispose of the surplus--primarily at a landfill.

In the case of Rome and Floyd, the issues will be how much waste tonnage each can guarantee on a monthly and annual basis, and whether each will be willing to pledge payment of a disposal fee for the guaranteed tonnage, including any tonnage shortfall. A guaranteed tonnage, clearly, carries with it the commitment by the City and County to pay the disposal fee charged by the recovery facility. To some extent these issues have a chicken-and-egg characteristic. That is, it may be difficult to decide to agree to a put-or-pay contract without knowing exactly what the disposal fee will be. However, a decision by the County and City to proceed with a full-scale feasibility effort should be based upon a willingness to enter into a put-or-pay agreement if project economics appear viable. As part of this consideration, the City and County should recognize that the possibility exists for requiring a vendor to guarantee the disposal fee. Any economic analysis done as part of the project feasibility should examine the possibility of structuring the project to provide for a guaranteed disposal fee.

Critically related to the issue of the amount of waste which the City and County can guarantee is their ability to direct where individuals and private haulers must dispose of waste.

b. The Power to Direct Delivery of Solid Waste to a Recovery Facility - The ability to direct individuals and businesses to dispose of their solid wastes at a recovery facility would appear to require a new ordinance by the County and possible amendments to the City's "Garbage, Trash and Waste Disposal Ordinance." Under the City's waste disposal ordinance all persons or establishments who dispose of any garbage, trash, commercial or other wastes, "shall make such disposal at the city landfill, trash burning sites, or otherwise as specified by the sanitary superintendent" (Section 15-23). This wording appears broad enough to empower the superintendent to require disposal at a resource recovery facility. However, the language of Section 15-20 regarding disposition of commercial wastes generated by establishments which are exempted from collection by city "garbage" trucks suggests that those establishments are free to dispose of their waste wherever they please, "provided that such disposal shall be in a manner satisfactory to the sanitary superintendent." While Section 15-23 appears to substantially restrict the choice of disposal site by industrial and commercial establishments responsible for their own disposal, because of the language of Section 15-20 a possibility may exist that a private hauler retained by such establishments could dispose of collected wastes at other than sites or facilities designated by the superintendent. Furthermore, Section 15-20, by exempting from city collection industrial and commercial establishments whose "wastes which cannot be placed in garbage containers as specified in this article and which amount to more than four such containers at one time," tends to weaken the

City's authority and responsibility for collection and disposal and may pose a legal question on the ownership of such wastes when collected by private haulers (scavengers), especially cardboard, metal barrels, other scrap metal, computer print-out paper, and punch-cards--hence, the power of the City to direct that they must be disposed of at a facility or site designated by it. Recent information prepared by the Rome-Floyd County Planning Commission indicates that a number of private haulers (scavengers) are reclaiming a number of paper products from commercial and industrial waste streams, which they sell to Dalton Waste Paper Company, Rome Waste Paper Company and other middlemen. Such recycling activities should be supported and encouraged. However, it would be desirable if these activities of private haulers were conducted as collection agents of the City in order to avoid any potential legal issues over ownership of the solid wastes they collect. Moreover, if private haulers acted as collection agents for the City, it would be in a stronger and more confident position to guarantee delivery of a specified monthly and annual tonnage to a resource recovery facility.

Private haulers of commercial and industrial wastes account for a substantial proportion of solid wastes collected within the City. Exclusive of brush and trash, about 22 percent of the total cubic yardage received in 1977 at the City's landfill was delivered by private haulers of commercial wastes. Private haulers of solid wastes generated by industrial establishments located within the City were required to use the County's Berryhill landfill, since the City does not accept industrial waste at its landfill. If it is assumed that 20 percent of the industrial wastes delivered to Berryhill were brought by haulers servicing industrial establishments located in the City, then private haulers would account for an estimated 45 percent of all wastes (exclusive of brush and trash) generated within the City. It is clear from the preceding that tighter control over the activities of private haulers operating within the City would be desirable. While this might be accomplished through the licensing of private haulers ("scavengers") under the City's waste disposal ordinance, it is not clear that this actually could be achieved because the ordinance is silent on the power of the City to place special conditions and requirements in the license.

Based upon the foregoing considerations, it is suggested that the City initiate the following types of modifications to its ordinance:

- Section 15-23 should be amended to include resource recovery and recycling facilities, whether owned and operated by the City or others. In addition the superintendent of sanitation should be explicitly empowered to direct disposal of wastes which are not processable at a resource recovery and/or recycling facility to land disposal sites owned and operated by the City or by others.

- Section 15-20 should be modified to make it the explicit responsibility of the City to collect all commercial and industrial wastes. In the case where such wastes exceed four containers or have physical characteristics preventing their being placed in containers of the required specification, the City should have the power at its discretion to permit either the establishment or a private hauler to serve as an agent of the City for collection and disposal. Where a private hauler serves as an agent of the City it should be explicit that the costs of his services are a matter of negotiation between the hauler and prospective user of his services.

- Sections 15-24 and 15-25 should be modified to define that a private hauler serves as a collection agent of the City and as such, is subject to terms and conditions as may be reasonably required by the superintendent of sanitation, including delineation of establishments to be served, maximum rates which may be charged, and frequency of service to be provided. As part of the terms and conditions, the superintendent should be authorized to permit the recovery of specified recyclable materials by each private hauler, with the hauler being entitled to retain the proceeds from such recovery activity. The superintendent also should be authorized to designate disposal facilities (including resource recovery) to be used for specified types of wastes. Violations of any of the terms and conditions could result in revocation of the right to operate within the City for at least one year and subject violators to liabilities. Any reinstatement should require posting of a performance bond. The amount of the bond should be determined by the superintendent; but a minimum amount should be specified by ordinance which is reasonable, but related to the incremental cost to the City, if it had to assume the actual collection or had to seek the services of another firm which required rates higher than those charged by the defaulting private collector.

- A new section should be introduced authorizing the superintendent of sanitation to establish and modify special collection or franchise districts, in which private firms could serve as agents of the City for collection and disposal of solid wastes. Provision should be made requiring that establishment of, or modification to, such special collection (or franchise) districts be made in consultation with, and based upon advice and recommendation from, representatives of the private haulers operating in the Rome-Floyd County area. Consideration also should be given to requiring the superintendent to hold a public hearing prior to formal adoption of special collection districts. This section also should spell out how agents will be procured, e.g., competitive bids, qualification submissions, etc.; period for which they can be retained; and provisions for renewal (if any) of contracts or franchises.
- Section 15-12 dealing with definitions should be modified to reflect the proposed changes in other sections. In addition, the categories of waste probably should be redefined to be more inclusive (e.g., construction debris is not currently included in this section) and to take into account that only certain types of wastes are processable at a resource recovery facility. In addition, definitions should be provided for resource recovery and recycling.

Available information indicates that the County lacks a waste disposal ordinance. It is imperative that such an ordinance be adopted, if the County is to participate in a resource recovery project. Essentially a County waste disposal ordinance should contain provisions similar to the modifications suggested for the City's ordinance. The basic thrust of such an ordinance would be to authorize the creation of collection or franchise districts, the procedures for establishing those districts, and procedures for procuring the services of waste collection agents. The important feature is that private haulers become agents of the County, in order to avoid legal issues of waste ownership. As agents they would be subject to administrative determination of where they may dispose of the solid waste which they collect on behalf of the County. As suggested for the City, provision should be made for administrative discretion to grant permission of haulers to reclaim specified recyclable materials.

In drafting a County ordinance and modifications to the City ordinance, close coordination should be maintained between the two governments in order to assure that any potential loopholes or legal issues are avoided. As a result, it may be desirable for the City and County to jointly create a task force to draft coordinated, but separate, ordinances for consideration by the respective legislative bodies. Under any case it probably would be wise to consult with both private haulers and representatives of commercial and industrial establishments during the course of preparing draft ordinances. While a waste disposal ordinance for the County and modifications to the City waste disposal ordinance have been suggested in the context of requirements for a successful resource recovery project, it is believed that these suggestions are basically appropriate for good solid waste management.

If implemented, both units of government would have all necessary controls over solid waste collection and disposal and flexibility to deal at some future date with some form of recovery--energy, materials, or both--with one exception. That exception would be source separation of selected materials by households, businesses, and industry. Therefore, if the City and County agree to undertake the kinds of waste control legislation previously suggested, they may wish to provide authority for requiring (at some future date) separation of newspapers, magazines, cardboard, glass by two colors, and cans, white goods and other oversized bulky metallic wastes from "garbage" and "trash" (including tree stumps and construction debris). Future implementation of such authority would depend upon decisions about energy recovery, existence of viable markets for specific materials, the willingness of government and private haulers to modify collection equipment and practices, and the commitment of government to develop and implement an on-going public education program in order to assure positive public response and high levels of participation.

C. Conclusions and Summary

Waste control, procurement, and marketing have been identified as the three critical aspects of resource recovery which require a legal and institutional framework designed to permit efficient and effective project implementation. Code Chapter 69-15a, passed by the Georgia Legislature in 1978, establishes Resource Recovery Development Authorities which have maximum flexibility in the method used to acquire a recovery system and market recovered products, are empowered to enter into long-term contracts (up to 50 years) with both public and private entities, and can serve as a financing vehicle through the use of revenue bonds which would not involve the full-faith and credit of the City or County. Revenue bond financing has an advantage over other forms of public financing in that it forces rigorous analysis to determine that a project is economically feasible. It has been strongly suggested that the City and County jointly activate such an authority if they decide to proceed with a full-scale feasibility effort. While an authority has a number of important advantages over City or County sponsorship of a project, there are a number of issues which must be resolved prior to its activation. One of the most important of these issues is how to provide a newly created Authority with operating funds, since such an Authority has no taxing or similar powers for raising operating revenues. While a number of suggestions have been offered with respect to operating funds, it was concluded that a satisfactory solution would require considerable cooperation and ingenuity on the part of the County and City.

Because individuals and private haulers (especially the latter) collect and dispose most of the solid waste generated in the Rome-Floyd County area, it is recommended that more explicit control over private haulers be instituted. While the City's waste disposal ordinance appears to provide sufficient power to the City to direct wher private haulers could dispose of the commerical and industrial wastes they collected, several modifications are suggested in order to eliminate any potential legal issues. For both the County (through a new ordinance) and the City it is recommended that private haulers essentially become collection agents of the two governments. The status of "agent" would eliminate any potential legal issues and provide the County and City with the power necessary to confidently enter into put-or-pay type contracts for delivery of waste to a resource recovery facility. It is also suggested that any new ordinances or modifications to old ones should provide authority to implement (at some future date) source separation programs, should conditions warrant consideration of such an approach.

APPENDIX A

SPECIFICATIONS FOR RECOVERED ALUMINUM

SPECIFICATIONS FOR ALUMINUM RECOVERED FROM MIXED MINICIPAL REFUSE

The scrap aluminum in mixed municipal refuse must be separated from all other materials. If the material is reclaimed using dry processing following thermal treatment of the refuse, it must be baled to a density of 240—400 kg/m^3. If the aluminum is separated from raw refuse or if wet processing techniques are used to separate the aluminum, the aluminum must be shredded or dried prior to baling. The shredded material must pass over a U.S. Standard 12 mesh screen (1.68 mm) to reduce fines (dust, dirt, sand, paint, etc.). Fines smaller than 1.68 mm must not exceed 3 percent of gross weight. The finished product must be baled to a minimum density of 240—400 kg/m^3. Alternatively, dry shredded material may be shipped loose if it has a density of 240—400 kg/m^3. Analyses will be on the melt of a total shipment.

Each shipment shall yield after melting a total net weight of at least 85 percent of the gross weight of aluminum scrap received and shall contain by chemical analysis the following maximum elements.

Element	Grade A maximum weight percent	Grade B maximum weight percent
Si	0.30	0.5
Fe	0.60	1.0
Cu	0.25	1.0
Mn	1.25	1.25
Mg	2.0	2.0
Cr	0.10	0.3
Ni	0.05	0.3
Zn	0.25	1.0
Ti	0.05	0.05
Bi	0.02	0.5
Pb	0.02	0.3
Sn	0.02	0.3
Others (each)	0.04	0.05
Others (total)	0.12	0.15
Al	Remainder	Remainder

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Revised June, 1977, Reynolds Metals Company

APPENDIX B

APPENDIX B

SUMMARY OF COST ESTIMATES FOR DISPOSAL OPTIONS

Table B-1: Energy Recovery Capital Cost Summary - RDF Production

Table B-2: Energy Recovery Initial Year Estimated Annual Costs and Revenues - RDF System

Table B-3: Estimated 1984 Savings in Landfill Costs from Implementation of RDF Project

Table B-4: Energy Recovery Estimated Capital Cost Summary - Modular Combustion System

Table B-5: Energy Recovery Initial Year Estimated Annual Cost and Revenues - Modular Combustion System

Table B-6: Initial Capital Cost Estimates for New Landfill Options in Rome-Floyd County (1979 Dollars)

Table B-7: Initial Incremental Capital Cost Estimates to Meet EPA Landfill Guidelines in Rome-Floyd County (1979 Dollars)

Table B-8: Initial Year Annual Cost Estimates for New Landfill Options in Rome-Floyd County (1979 Dollars)

Table B-9: Initial Incremental O&M Costs Required to Meet EPA Landfill Guidelines in Rome-Floyd County (1979 Dollars)

Table B-10: 1984 Annual Cost Estimates for New Landfill Options in Rome-Floyd County (1984 Dollars)

TABLE B-1

ENERGY RECOVERY CAPITAL COST SUMMARY
RDF PRODUCTION
($1,000)

Cost Category	1979 Dollars	Escalation Factor	1984 Dollars
A. SITE COST			
1. Site Acquisition: 40,000 sf. @ $1/sf.	$ 40	1.3328	$ 53
B. CONSTRUCTION & EQUIPMENT			
2. Site Preparation & Foundation	300	1.4102	423
3. Building: 8,000 sf. @ $40/sf.	320	1.4972	479
4. Process Equipment	1,101	1.4039	1,546
5. RDF Receiving Facilities	1,400	1.4039	1,965
6. Transfer Trailers & Equipment	190	1.4039	267
SUBTOTAL: CONSTRUCTION COSTS	$3,311	. . . .	$4,680
C. ENGINEERING & CONTRACTOR COSTS			
7. Permits & Fees @ 1% Construction Costs	$ 33	NA	$ 47
8. Engineering & Construction Management @ 8% Construction Costs	266	NA	374
9. Contractor Costs			
a. Performance Bond @ 0.5% Construction Costs	17	NA	23
b. Profit @ 17% Items 2 and 3	105	NA	153
D. MISCELLANEOUS			
10. Spare Parts Inventory @ 2% Items 4, 5 and 6	$ 54	NA	$ 76
11. Start-up, Testing and Acceptance @ 30% Items 4 and 5	750	NA	1,053
12. Contingency @ 10% Construction Cost	331	NA	468
SUBTOTAL: CAPITAL COST	$4,864	. . . .	$6,927

TABLE B-1--Continued

Cost Category	1979 Dollars	Escalation Factor	1984 Dollars
E. FINANCING COSTS			
13. Legal Services	NA	NA	$ 33
14. Engineering Feasibility Report	NA	NA	53
15. Interest during Construction	NA	NA	614
16. 1-yr. Debt Service Reserve Fund	NA	NA	828
17. Underwriter's fee @ 2.5% Total Cost	NA	NA	219
SUBTOTAL			$8,774
LESS:			
Interest Earned @ 9% on			
a. Debt Service Reserve Fund for 27 months	NA	NA	$ 186
b. Interest During Construction for average of 7 months	NA	NA	32
c. Start-up, Testing and Acceptance for average of 22 months	NA	NA	174
TOTAL SIZE OF BOND ISSUE			$8,382

NOTES:

Escalation factors are based upon extrapolations of trend line analysis 1971-1978 for the following cost indices by category which were converted to a base year of 1979.

- Site Acquisition - Consumer Price Index to mid-year 1981.
- Site Preparation and Foundation - Engineering News-Record Building Cost Index through first quarter 1982.
- Building-Engineering News-Record Building Cost Index until January 1983.
- Process Equipment, RDF Receiving Facilities, and Transfer Trailers and Equipment - BLS General Purpose Machinery and Equipment Index through first quarter 1982.

TABLE B-2

ENERGY RECOVERY INITIAL YEAR ESTIMATED ANNUAL COSTS AND REVENUES RDF SYSTEM

Cost Category	1979 Dollars	Escalation Factors	1984 Dollars
A. O&M COSTS			
1. Labor			
• Assume following on-site personnel:			
- 1 Facility Manager @ $8.00/hr	$ 16,600		
- 1 Bookkeeper/Typist @ $4.50/hr	9,400		
- 1 Scale Operator/Clerk @ $4.00/hr	8,300		
- 1 Front-end Load Operator @ $5.50/hr	11,400		
- 2 Equipment Operators @ $5.00/hr	20,800		
- 2 Maintenance Mechanics/Electrician @ $6.00/hr	25,000		
- 2 Drivers @ $6.50/hr	27,000		
- 1 Janitor @ $4.50/hr	9,400		
- 2 Security Guards @ $4.50/hr	18,800		
SUBTOTAL: DIRECT LABOR	$ 146,700		
Assumes each employee works 2080 hrs/yr (40 hrs/wk x 52 wks/yr)			
• Assume fringe benefits and paid absences equal 25% of direct labor costs	$ 37,000		
TOTAL LABOR COSTS	$ 183,700	1.6117	$296,100
2. Equipment Maintenance Cost			
- Maintenance & Repairs @ 4% of Capital Cost of Equipment	$ 108,000		$151,100
- Parts Inventory @ 2% Capital Cost of Equipment	54,000		76,000
3. Fuel			
- Tractors @ 36,400 miles/yr @ 4 mi/gal x 75¢/gal	$ 6,800	1.6783	$ 11,400
- Front-end Loader @ 1 gal/hr x 75¢/gal	$ 1,600	1.6783	2,700
- Residual Truck @ 36,400 mi/yr @ 6 mi/gal x 75¢/gal	4,600	1.6783	7,700
4. Utilities	$ 80,000	1.6783	$134,300

TABLE B-2 -- Continued

Cost Category	1979 Dollars	Escalation Factor	1984 Dollars
5. Insurance			
• 2% of Construction Costs	$ 66,000	NA	$ 93,600
6. Administrative and General Expense			
- Legal	$ 2,000	1.6783	$ 3,400
- Accounting	6,000	1.6783	10,100
- Office Supplies	1,000	1.6783	1,700
7. Residual Disposal Costs on			
- 28,015 TPY @ $10/Ton: 1979	$ 280,200		
- 29,443 TPY @ $13/Ton: 1984			$ 382,800
8. Replacement Sinking Fund			
- Rolling Stock: 5-yr life, straight line	$ 38,000	NA	$ 53,400
- Process Equipment: 20-yr life, straight line	55,000	NA	77,300
- Receiving Facility: 20-yr life, straight line	70,000	NA	98,200
SUBTOTAL	$ 962,500	NA	$1,399,800
9. Operator Fee			
• 13% of Items 1-6	$ 67,500	NA	$ 102,500
SUBTOTAL: ANNUAL O & M	$1,030,000	NA	$1,502,300
Plus:			
ANNUAL DEBT SERVICE	NA	NA	$ 828,000
TOTAL ANNUAL COST	NA	NA	$2,330,300
Less:			
REVENUES			
1. RDF Revenues			
- Ranges between value based on 1979 price of bark of 67¢/million Btu adjusted for higher heating value of RDF; i.e., $8/ton RDF inflated by projection of Consumer Price Index to $13/ton in 1984 and current price of coal @ $1.42 mmBtu, or $17/ton RDF inflated by projection of Consumer Price Index to $28.50/ton in 1984. In 1984 anticipated would sell 45,430 TPY of RDF based on assumed 1%/yr increase in solid waste generation between 1979 and 1984.	NA		$590,600 to $1,296,200

TABLE B-2 -- Continued

Cost Category	1979 Dollars	Escalation Factor	1984 Dollars
2. Interest Earned			
Total Sinking Fund @ 9%	NA		$ 20,600
NET DISPOSAL COST	NA	$1,719,100 to	$1,013,500
- Net Disposal Cost/Input Ton (74,984 TPY)	NA	$23.00/T to	$13.50/T
3. 1984 Landfill Credit Savings			
- Reduce tonnage to be landfilled in 1984 from 97,954 TPY to 52,524 TPY. Of this tonnage an estimated 29,443 TPY are residuals for which the disposal cost @ $13/T has been included in O&M for RDF facility. (See Appendix Table B-3, for detailed estimate.)			$ 641,000
NET NET DISPOSAL COST FOR RDF FACILITY	NA	NA	$1,078,000 to $ 372,400
- Net Net Cost per Input Ton of 74,874 TPY	NA	$14.40/T to	$500/T
NET SYSTEM DISPOSAL COST (FOR RED AND LANDFILL OPERATIONS)		$1,725,400 to	$1,019,800
- Net System Cost per Ton Disposed (97,954 TPY)	NA	$17.60/T to	$10.40/T
NET COST PER TON NEW JOINT LANDFILL (97,954 TPY)	NA		$13/T (From Table B-10)

TABLE B-3

ESTIMATED 1984 SAVINGS IN LANDFILL COSTS FROM IMPLEMENTATION OF RDF PROJECT

	(1) Landfill w/RDF Facility	(2) Landfill w/o Resource Recovery	(3) Savings in Landfill Cost (2 minus 1)
TOTAL LABOR COST	$ 139,900	$ 179,200	$ 39,300
EQUIPMENT MAINTENANCE	38,300	39,700	1,400
FUELS	33,600	33,600	-0-
UTILITIES & MISCELLANEOUS	8,400	8,400	-0-
INSURANCE	50,300	50,300	-0-
ADMINISTRATIVE	14,500	16,900	2,400
EPA GUIDELINE COSTS	174,400	250,800	76,400
ANNUAL DEBT SERVICE	259,800	326,100	66,300
CAPITAL RESERVE ACCOUNTS	311,000	383,500	72,500
TOTAL ANNUAL COST & COST SAVINGS	$1,030,200	$1,288,500	$258,300
LESS:			
Annual Cost Contribution from RDF Facility	$ 382,800	-0-	-0-
NET ANNUAL COST & COST SAVINGS	$ 647,400	$1,288,500	$641,100

NOTES:

1. Cost estimates in Column 2 are those for a new joint County and City landfill. (See Appendix Table B-11 for detailed estimates.)

2. Cost estimates in Column 1 are essentially those for a new County-developed and -operated landfill (Table B-11). Adjustments were made to account for the fact that a new landfill with an RDF facility would handle a smaller annual tonnage than estimated for a County-only landfill. A new City landfill would not be required. Savings resulting from the closing of the City

TABLE B-3--Continued

NOTES--Continued

landfill (or the need not to develop a new landfill) have not been accounted for in this analysis. As shown in Table B-10, the 1984 annual cost for a new City landfill is estimated to amount to $876,800.

Adjustments to cost items for a new County landfill included the following:

- Labor costs for a new City landfill were used, on the assumption that the landfill would not have to open on weekends. The difference in labor costs between County-only and City-only landfills is estimated to be $3,000. (See Table B-10.)

- EPA Guideline Costs for both capital and operating costs were adjusted downward by the ratio of the tonnage for a County landfill with resource recovery to the tonnage for a County landfill without resource recovery (52,524 TPY ÷ 63,166 TPY = .8315). The reduction in EPA Guideline capital costs had the effect of reducing total capital costs for a new landfill, hence annual debt service.

- The capital reserve account for opening a new section of landfill, which estimate included EPA Guideline Costs, was also reduced by a factor of .8315.

TABLE B-4

ENERGY RECOVERY ESTIMATED CAPITAL COST SUMMARY
MODULAR COMBUSTION SYSTEM
($1,000)

Cost Category	1979 Dollars	Escalation Factors	1984 Dollars
A. SITE COST			
1. Site Acquisition: 100,000 sf @ $1/sf	$ 100	1.3328	$ 133
B. CONSTRUCTION & EQUIPMENT			
2. Site Preparation & Foundation	528	1.4102	745
3. Building including Instrumentation: 36,000 sf @ $40/sf	1,440	1.4972	2,156
4. Combustion Units, Boilers, Ash System	2,321	1.4039	3,258
5. Other Equipment including Scales	169	1.4039	237
6. Steam Lines	225	1.4972	337
SUBTOTAL: CONSTRUCTION COSTS	$4,683	. . . .	$6,733
C. ENGINEERING & CONTRACTOR COSTS			
7. Permits & Fees @ 1% Construction Costs	$ 47	NA	$ 67
8. Engineering & Construction Management @ 8% Construction Costs	375	NA	539
9. Contractor Costs			
a. Performance Bond @ 0.5% Construction Costs	23	NA	34
b. G&A @ 3% Construction Costs	140	NA	202
c. Profit @ 17% of Items 2 & 3	335	NA	493
d. Insurance During Construction @ 2%	94	NA	135
e. Project Management & Training	54	1.6783	91
f. Equipment Erection @ 2.5% of Item 4	58	NA	81
D. MISCELLANEOUS			
10. Spare Parts Inventory @ 1.5% Items 4 & 5	$ 35	NA	$ 52
11. Start-up, Testing & Acceptance @ 8% of Items 4 & 5	194	NA	280
12. Contingency @ 10% Construction Costs	468	NA	673
13. Freight Cost on Equipment @ 4% Items 4 & 5	100	NA	140
SUBTOTAL: CAPITAL COSTS	$6,606	. . . .	$9,520

TABLE B-4 -- Continued

Cost Category	1979 Dollars	Escalation Factors	1984 Dollars
E. FINANCING COSTS			
14. Legal Services	NA	NA	$ 33
15. Engineering Feasibility Report	NA	NA	53
16. Interest During Construction @ 7%	NA	NA	830
17. 1-Year Debt Service Reserve Fund: 20 years @ 7%	NA	NA	1,118
18. Underwriter's Fee @ 2.5% Total Cost			296
SUBTOTAL:	NA	NA	$11,850
LESS:			
F. INTEREST EARNED @ 9% ON:			
1. Debt Service Reserve Fund for 27 months	NA	NA	$ 352
2. Interest During Construction Account for average of 7 months	NA	NA	44
3. Start-up, Testing and Acceptance Account for average of 22 months	NA	NA	71
TOTAL SIZE OF BOND ISSUE	NA	NA	$11,383

TABLE B-5

ENERGY RECOVERY INITIAL YEAR ESTIMATED ANNUAL COST AND REVENUES MODULAR COMBUSTION SYSTEM

Cost Category	1979 Dollars	Escalation Factors	1984 Dollars
A. O&M COSTS			
1. Labor			
• Assume following on-site personnel:			
- 1 Facility Manager @ $8.00/hr	$ 16,600		--
- 2 Shift Managers @ $7.50/hr	31,200		--
- 1 Bookkeeper/Typist @ $4.50/hr	9,400		--
- 1 Scale Operator/Clerk @ $4.00/hr	8,300		--
- 4 Primary Operators @ $5.50/hr	45,800		--
- 1 Maintenance Mechanic @ $6.00/hr	12,500		--
- 1 Asst. Maintenance Mechanic @ $5.00/hr	10,400		--
- 4 Relief Loader Operator & Shift Maintenance Man @ $5.50/hr	45,800		--
- 1 Ash Truck Operator @ $5/hr	10,400		
Assume each employee works 2080 hrs/yr (40 hrs/wk x 52 wks/yr)			--
SUBTOTAL: DIRECT LABOR	$190,400		--
• Assume fringe benefits and paid absences equal 25% of direct labor costs	47,600		
TOTAL LABOR COSTS	$238,000	1.6117	$383,600
2. Maintenance Costs			
- Equipment Maintenance @ 13% of Capital Cost Other Equipment Exclusive of Sales	$ 18,100	NA	$ 25,300
- Maintenance Parts @ 3.5% of Capital Cost of Combustion Units, Boilers, etc.	81,200	NA	114,000
- Building Maintenance @ 0.5% of Building Cost	7,200	NA	10,800

TABLE B-5 -- Continued

Cost Category	1979 Dollars	Escalation Factors	1984 Dollars
3. Fuel			
- Auxiliary Fuel 1.7 gal/ton @ 40¢/gal (1979) & 67¢/gal (1984)	$ 48,400	NA	85,300
- Front-end Loaders 1 gal/hr @ 75¢/gal/loader	6,400	1.6783	10,700
- Residual Truck @ 36,000 mi/yr @ 6 mi/gal x 75¢/gal	4,600	1.6783	7,700
4. Utilities			
- Electricity 2400 kwh/day @ 3.5¢/kwh x 260 days	$ 21,800	1.6783	36,600
- Water (assumes 50% make-up, balance condensate return)	4,500	1.6783	7,600
- Chemicals for water treatment	4,000	1.6783	6,700
5. Insurance			
- 2% of Construction Cost	93,700		134,700
6. Administrative and General Expense			
- Legal	2,000	1.6783	3,400
- Accounting	6,000	1.6783	10,100
- Office Supplies	1,000	1.6783	1,700
- Janitorial Services @ $150/mo.	1,800	1.6783	3,000
- Miscellaneous	5,000	1.6783	8,400
SUBTOTAL:	$543,700		$849,600
7. Residual Disposal			
- 24,440 TPY @ $10/T (1979)	$244,400		
- 25,686 TPY @ $13/T (1984)			$333,900
8. Replacement Sinking Fund			
- Rolling Stock: 5-yr life straight line	$ 27,800		$ 39,000
9. Operator Charges			
- Fee @ 13% Items 1-6	$ 70,000		$110,400
- Management Services	10,000	1.6783	16,800
SUBTOTAL: ANNUAL O&M	$896,600		$1,349,700

TABLE B-5 -- Continued

Cost Category	Dollars	Factors	Dollars
PLUS:			
ANNUAL DEBT SERVICE	NA	NA	$1,118,000
TOTAL ANNUAL COST	NA	NA	$2,467,700
LESS:			
REVENUES			
1. Steam Revenues			
- Ranges between value based on 1979 price for No. 6 oil @ 2.2% sulfur content and 152,000 Btu of 40.5¢/gal, or $3.06/1,000 lbs of steam (assuming 85% boiler efficiency), inflated by projections of change in Consumer Price Index 1979-1984, to $5.14/1000 lbs of steam; and a 1979 price for No. 6 oil @ 1.0% sulfur content and 152,000 Btu of 45.2¢/gal, or $3.42/1,000 lbs of steam, inflated by projection of change in Consumer Price Index 1979-84 to $5.74/1000 lbs of steam. In 1984 estimated would sell 65,700 lbs steam/hr, 20 hrs/day, 260 days/yr.			$1,754,500 to $1,962,500
2. Interest Earned			
- Sinking Fund @ 9%			$ 3,500
NET DISPOSAL COST FOR STEAM FACILITY			$ 709,700 to $ 501,700
- Net Disposal Cost/Input Ton (74,874 TPY)			$9.50/T to $6.70/T
3. 1984 Landfill Credit Savings			
Reduce tonnage to be landfilled in 1984 from 97,954 TPY to 48,766 TPY. Of this tonnage, an estimated 25,686 TPY are residuals for which the disposal cost @ $13/T has been included in O&M for steam facility.			$ 592,200
NET NET DISPOSAL COST FOR STEAM FACILITY			$ 117,500 to zero
- Net Net Cost per Input Ton of 74,874 TPY			$1.60/T to zero
NET SYSTEM DISPOSAL COST (Steam Production & Landfill Operations)			$ 813,800 to $696,300
- Net System Cost per Ton Disposed (97,954 TPY)			$8.30/T to $7.10/T
NET COST PER TON NEW JOINT LANDFILL (97,954 TPY)			$13/T (From Table B-10)

TABLE B-6

INITIAL CAPITAL COST ESTIMATES FOR NEW LANDFILL OPTIONS IN ROME-FLOYD COUNTY (1979 Dollars)

Cost Category	Joint Landfill	County Landfill	City Landfill
1. Site Acquisition			
Assumed acquisition cost is $1,000/ac.			
- 250-acre site	$250,000		
- 150-acre site		$150,000	
- 90-acre site			$ 90,000
2. Clearing and Grubbing			
$200/ac. x 20% of site to be initially cleared. (Excludes buffer acreage, which accounts for 50% of total site acreage.)	$ 2,500	$ 1,500	$ 900
3. Fencing for Litter Control			
- Assume 9,302 linear feet for 125 ac. @ $15/l.f.	$139,500		
- Assume 7,205 linear feet for 75 ac. @ $15/l.f.		$108,100	
- Assume 5,581 linear feet for 45 ac. @ $15/l.f.			$ 83,700
4. Access Road			
- Assume 2,500 ft of paved road @ $30/l.f. x 30% initially installed	$ 22,500		
- Assume 1,500 ft of paved road @ $30/l.f. x 30% initially installed		$ 13,500	
- Assume 900 ft of paved road @ $30/l.f. x 30% initially installed			$ 8,100
5. Fee Station (Scale House)			
- Mechanical, dial scales with 30-ton capacity, includes foundation	$ 15,000	$ 25,000	$ 15,000
6. Water Tank			
- Assumed 5,000-gallon tank	$ 5,000	$ 5,000	$ 5,000

TABLE 6 -- Continued

	Cost Category	Joint Landfill	County Landfill	City Landfill
7.	EPA Guideline Costs			
	Estimated incremental capital costs to control leachate, gas, and surface run-off. (See Table B-7 for details on cost estimates.)	$718,600	$596,900	$328,700
8.	Engineering and Permits	$100,000	$ 85,000	$ 75,000
9.	Contractor Costs			
	- Insurance	$ 50,000	$ 50,000	$ 50,000
	- Profit @ 15% on Items 1-6	173,000	133,500	79,700
		$223,000	$183,500	$129,700
10.	Equipment			
	- 1 Compactor @ $175,000	$175,000	$175,000	$175,000
	- 1 D-8 Crawler Tractor @ $170,000	170,000	150,000	150,000
	- 1 613B Scrapper @ $100,000	100,000	100,000	100,000
	- 1 Grader @ $70,000	70,000	70,000	70,000
	- 1 Water Truck	30,000	30,000	30,000
	- 1 Air Compressor	10,000	10,000	10,000
		$555,000	$535,000	$535,000
11.	Contingency			
	Assume 15%	$304,700	$254,000	$190,700
12.	Bond Issuance Cost			
	Assume 0.5% of Items 1-11	$ 11,700	$ 9,700	$ 7,300
	TOTAL SIZE OF BOND ISSUE. . . . . . . (Assume General Obligation Bonds)	$2,347,500	$1,957,200	$1,469,100
	ANNUAL DEBT SERVICE	$ 221,600	$ 184,700	$ 138,700
	- 7% for 20 yrs on $2,347,500 x (.09439)	$ 221,600		
	- 7% for 20 yrs on $1,957,200 x (.09439)		$ 184,700	
	- 7% for 20 yrs on $1,469,100 x (.09439)			$ 138,700

TABLE B-7

INITIAL INCREMENTAL CAPITAL COST ESTIMATES TO MEET EPA LANDFILL GUIDELINES IN ROME-FLOYD COUNTY

(1979 Dollars)

Control Technology	Landfill Unit Costs 200 TPD Cost/Ton	Landfill Unit Costs 100 TPD Cost/Ton	Total Costs for Landfill Options Joint Landfill	Total Costs for Landfill Options County Landfill	Total Costs for Landfill Options City Landfill
1. Leachate Control					
Leachate Collection	$0.47	$0.53	$213,800	$155,500	$ 85,600
Monitoring Wells	0.019	0.027	43,200	39,600	21,800
2. Gas Control					
Vertical Impermeable Barriers	$0.27	$0.40	$122,800	$117,300	$ 64,600
Monitoring Wells	0.007	0.013	15,900	19,100	10,500
3. Surface Runoff					
Ponding	$0.06	$0.07	$ 68,200	$ 51,300	$ 28,300
Dike Construction	0.56	0.73	254,700	214,100	117,900
TOTAL INCREMENTAL CAPITAL COSTS (1979 $) -			$718,600	$596,900	$328,700
TOTAL INCREMENTAL CAPITAL COSTS (1984 $) -			$1,165,200	$967,800	$533,000

NOTES:

1. Annual tonnage at a joint County-City landfill in 1979 is estimated to be 93,200 tons. This tonnage was escalated at a rate of 1 percent per year for 20 years (the assumed useful life of the new landfill). Total tonnage disposed for 20 years is estimated to be 2,274,400 tons. The 20-year tonnage was multiplied by the unit cost per ton for a 200 TPD landfill to estimate the total capital costs for each control technology. For leachate collection, placement of vertical impermeable barriers, and dike construction it was assumed that only 20 percent of the total capital cost would initially be required. For the development of run-off pond it was assumed that 50 percent of the total cost of pond construction would be initially required.

2. Annual tonnage at a new County landfill and a new City landfill in 1979 is estimated to be 60,100 TPY and 33,100 TPY, respectively. This tonnage was escalated at the rate of 1 percent per year for 20 years (the assumed useful life of the new landfills). Total tonnage disposed for 20 years at new County and City landfills is estimated to be 1,466,700 tons and 807,800 tons, respectively. The 20-year tonnage was multiplied by the unit cost per ton for a 100 TPD landfill. The same assumptions were made as for a jointly developed and operated landfill with respect to leachate collection, vertical impermeable barriers, dike construction, and pond construction.

TABLE B-7--Continued

NOTES--Continued

3. Landfill unit cost data are based upon data found on p. 186 of Draft Environmental Impact Statement On the Proposed Guidelines for the Landfill Disposal of Solid Waste prepared by the U.S. Environmental Protection Agency and published March 1979. Unit cost data are in 1977 dollars and were estimated for three different size landfills: 10 TPD, 100 TPD, and 300 TPD. Since a jointly developed landfill would handle approximately 200 TPD, a linear interpolation was made between the 100 TPD and 300 TPD landfill unit costs per ton. Estimates of 1979 unit costs were made based upon linear regression analysis of the Engineering News-Record Building Cost Index for the period 1971 to 1978, and projected for 1979. The ratio of 1979 to 1977 (1.33) was applied to EPA's 1977 unit costs to derive unit costs in 1979 dollars.

4. Estimates of capital costs for 1984 are based upon extrapolation of the trend in the annual percent change of the Engineering News-Record Building Cost Index for the period 1971 to 1978. The ratio of 1984 to 1979 (1.621) was applied to the estimated total incremental capital costs in 1979 dollars to derive an estimate in 1984 dollars.

5. The control technologies represent those assumed by USEPA as required to upgrade current landfill technology levels in order to meet proposed landfill guidelines. Assumptions used by USEPA in developing unit cost estimates per ton are as follows:

   - Leachate Collection - For a 100 TPD landfill 14,300 ft. of collector pipe and for a 300 TPD landfill 36,000 ft. of collector pipe. Piping is spaced at 100-ft. intervals plus perimeter. For a 200 TPD landfill a linear interpolation was made between the 100 TPD and 300 TPD requirements.

   - Monitoring Wells - For a 100 TPD landfill four wells were assumed required and for a 300 TPD landfill, seven wells were assumed.

   - Vertical Impermeable Barrier - 20-ft. depth, 60 cu. ft./ft. perimeter installation with clay liner.

   - Gas Monitoring Wells - For a 100 TPD landfill, eight wells, and for a 300 TPD landfill, 12 wells.

   - Ponding - Requirements based on 2-inch, 24-hour rainfall event with runoff storage required for twice the site landfill area. For a 100 TPD landfill depth of pond assumed to be 5 feet, and for a 300 TPD landfill, 10 feet.

   - Dike Construction - Ten-foot depth, 567 cu. ft./ft., and 3:1 slopes.

TABLE B-8

INITIAL YEAR ANNUAL COST ESTIMATES FOR NEW LANDFILL OPTIONS IN ROME-FLOYD COUNTY

(1979 Dollars)

Cost Category	Joint Landfill	County Landfill	City Landfill
A. O&M COSTS			
1. Labor			
• Assume following on-site personnel:			
- Supervisor @ $7.50/hr	1 @ $ 18,700	1 @ $ 18,700	1 @ $ 18,700
- Cover Equipment Operator @ $6.50/hr	1 @ 16,200	1 @ 16,200	1 @ 16,200
- Dozer Operator @ $6.50/hr	2 @ 32,400	1 @ 16,200	1 @ 16,200
- Scale Operator @ $4.00/hr	1 @ 10,000	1 @ 10,000	1 @ 10,000
- Maintenance Person @ $3.50/hr	1 @ 8,700	1 @ 8,700	1 @ 8.700
- Gatekeeper (Sundays only) @ $3.50/hr	1 @ 1,500	1 @ 1,500	--
- Spotter (Sundays only) @ $3.50/hr	1 @ 1,500	1 @ 1,500	--
Assume each full-time person works 2,496 hr/yr. (48 hrs/wk x 52 wks/yr). Weekend personnel work 416 hrs/yr (8 hrs/day x 52 days/yr).	$ 89,000	$ 72,800	$ 69,800
• Assume fringe benefits and paid absences equal 25% of direct labor costs	$ 22,000	$ 18,200	$ 17,000
TOTAL LABOR COST	$111,200	$ 91,000	$ 86,800
2. Equipment Maintenance Cost			
Based on p. 214, Handbook of Solid Waste Disposal, assume 17% of annual amortization costs of equipment			
- Joint Landfill : $135,000	$ 23,000		
- County Landfill : $130,500		$ 22,200	
- City Landfill : $130,500			$ 22,200
3. Fuels and Lubricants			
Cost assumption based on p. 214, Handbook of Solid Waste Disposal.	$ 20,000	$ 20,000	$ 20,000
4. Utilities and Miscellaneous			
Per Rome Sanitation Department Budget	$ 5,000	$ 5,000	$ 5,000

TABLE B-8--Continued

Cost Category	Joint Landfill	County Landfill	City Landfill
5. Insurance			
Based on Rome Sanitation Department Budget.	$ 30,000	$ 30,000	$ 30,000
6. EPA Guideline Costs			
Estimated costs for EPA Guidelines for Landfill Disposal of Solid Wastes for impermeable cover, leachate treatment and monitoring, and gas control monitoring. (See Table B-9 for detail on cost estimates.)	$145,500	$123,700	$ 68,100
7. Administrative and General Expense			
- Management	$ 6,000	$ 6,000	$ 6,000
- Legal	1,000	1,000	1,000
- Accounting	3,000	3,000	1,500
- Office Supplies	500	500	500
	$ 10,500	$ 10,500	$ 9,000
SUBTOTAL OF O&M COSTS	$345,200	$302,400	$241,100
Plus: ANNUAL DEBT SERVICE	221,600	184,700	138,700
SUBTOTAL ANNUAL COSTS	$566,800	$487,100	$379,800
Annual Cost per Ton:			
- 93,200 TPY	$ 6.08/T		
- 60,100 TPY		$ 8.10/T	
- 33,100 TPY			$11.47/T
Plus:			
8. Capital Reserve Account for Landfill Closing			
- Assume capital reserve account for final site landscaping, park development, and continued leachate and gas monitoring for 5 years following closing of landfill. Cost of closing assumed to be $7500/ac., to be obtained via equal payments over a 20-yr. period.	$ 46,900	$ 28,100	$ 16,900
- Assume capital reserve fund invested @ 9% interest and earned interest used to reduce annual costs of disposal.	($ 14,200)	($ 2,500)	($ 1,500

TABLE B-8--Continued

Cost Category	Joint Landfill	County Landfill	City Landfill
9. Capital Reserve Account for Opening New Section in 1988			
- Assume capital reserve account for opening new section of landfill, including additions to leachate collection, vertical impermeable barriers, dike system, grubbing and clearance, and paved road. Costs of opening obtained via equal payments over 9-year period 1979-88 (1979 dollar costs for these items factored by 2.1186 to obtain 1988 cost).	$145,000	$118,100	$ 65,200
- Assume capital reserve fund invested @ 9% interest and earned interest used to reduce annual costs of disposal.	($ 13,100)	($ 10,600)	($ 5,900)
10. Capital Reserve Account: Equipment			
- Equipment assumed to be depreciated on straight-line basis over 5-year basis.	$111,000	$107,000	$107,000
- Funds in the capital reserve account invested @ 9% interest, and earned interest retained in account to provide cushion against inflation of new equipment.	($ 10,000)	($ 9,600)	($ 9,600)
B. GRAND TOTAL ANNUAL COST (net earned interest deducted)	$935,000	$806,900	$641,300
• Annual Cost per Ton			
- 93,200 TPY	$10.00/T		
- 60,100 TPY		$13.43	
- 33,100 TPY			$19.37/T

TABLE B-9

INITIAL INCREMENTAL O&M COSTS REQUIRED TO MEET EPA LANDFILL GUIDELINES IN ROME-FLOYD COUNTY

(1979 dollars)

	Landfill Unit Cost		Total Costs for Landfill Options		
Control Technology	200 TPD Cost/Ton	100 TPD Cost/Ton	Joint Landfill	County Landfill	City Landfill
1. Leachate Control					
- Impermeable cover (On-Site)	$0.40	$0.46	$ 37,300	$ 27,600	$ 15,200
- Leachate Treatment	1.06	1.46	98,800	87,700	48,300
- Leachate Monitoring	0.08	0.11	7,500	6,600	3,600
2. Gas Control					
- Gas Monitoring	$0.02	$0.03	$ 1,900	$ 1,800	1,000
TOTAL INCREMENTAL O&M COSTS (1979 $)			$145,500	$123,700	$ 68,100
TOTAL INCREMENTAL O&M COSTS (1984 $)			$250,800	$209,700	$115,500

NOTES:

1. Annual tonnage in 1979 for a joint landfill was estimated to be 93,200 TPY, for a County landfill, 60,100 TPY, and for a new City landfill, 33,100 TPY. The annual tonnage for the joint landfill was multiplied by the unit cost per ton for a 200 TRD landfill to obtain total costs. For the separate County and City landfills annual tonnage was multiplied by the unit cost per ton for a 100 TPD landfill to obtain annual total cost for each control technology.

2. The 1984 dollar cost estimates were calculated on the basis of projecting unit cost per ton values utilizing a trend line projection of the annual percent changes in the Engineering News-Record Common Labor Cost Index for the period 1971-78. The resulting percent change in the Index for 1984 was converted to a multiplier factor by dividing the 1984 value by the projected percent change value for 1979. This procedure yielded a multiplier for the period 1979-1984 of 1.6117, which was applied to each control technology unit cost per ton (1979 dollars) to obtain unit cost per ton in 1984 dollars. The 1984 unit costs per ton were multiplied by appropriate annual tonnages, which were assumed to increase by 1 percent per year. In the 1984 estimate, the joint landfill was projected to handle 97,954 TPY, a new County landfill 63,166 TPY, and a new City landfill 34,788 TPY.

TABLE B-10

1984 ANNUAL COST ESTIMATES FOR NEW LANDFILL OPTIONS IN ROME-FLOYD COUNTY

(1984 Dollars)

Cost Category	Joint Landfill	County Landfill	City Landfill
A. O&M COSTS			
1. Labor			
• $111,200 x 1.6117	$179,200		
• $ 91,000 x 1.6117		$146,700	
• $ 86,800 x 1.6117			$139,900
2. Equipment Maintenance Costs			
• $23,000 x 1.7261	$ 39,700		
• $22,000 x 1.7261		$ 38,300	$ 38,300
3. Fuels and Lubricants			
• $20,000 x 1.6783	$ 33,600	$ 33,600	$ 33,600
4. Utilities and Miscellaneous			
• $5,000 x 1.6783	$ 8,400	$ 8,400	$ 8,400
5. Insurance			
• $30,000 x 1.6783	$ 50,300	$ 50,300	$ 50,300
6. EPA Guideline Costs			
• Impermeable Cover (On-Site)			
- 40¢/Ton x 1.6117 x 97,954TPY	$ 67,700		
- 46¢/Ton x 1.6117 x 63,166 TPY		$ 46,700	
- 46¢/Ton x 1.6117 x 34,788 TPY			$ 25,700
• Leachate Treatment			
- $1.06/Ton x 1.6117 x 97,954 TPY	$167,500		
- $2.35/Ton x 1.6117 x 63,166 TPY		$148,400	
- $2.35/Ton x 1.6117 x 34,788 TPY			$ 81,800
• Leachate Monitoring			
- 8¢/Ton x 1.611T x 97,954 TPY	$ 12,700		
- 11¢/Ton x 1.6117 x 63,166 TPY		$ 11,400	
- 11¢/Ton x 1.6117 x 34,788 TPY			$ 6,300

TABLE B-10--Continued

Cost Category	Joint Landfill	County Landfill	City Landfill
• Gas Monitoring			
- 2¢/Ton x 1.6117 x 97,954 TPY	$ 2,900		
- 3¢/Ton x 1.6117 x 63,166 TPY		$ 3,200	
- 3¢/Ton x 1.6117 x 34,788 TPY			$ 1,700
7. Administrative and General Expenses			
• $10,500 x 1.6117	$ 16,900	$ 16,900	$ 16,900
SUBTOTAL: O&M Cost	$578,900 . .	$503,900 . .	$400,500
PLUS:			
B. ANNUAL DEBT SERVICE	$905,000	$779,100	$609,400
C. CAPITAL RESERVE ACCOUNTS			
• Landfill Closing	$ 46,900	$ 28,100	$ 16,900
• Landfill-New Section Opening	145,000	118,100	65,200
• Equipment Depreciation	191,600	184,700	184,700
LESS:			
INTEREST EARNED			
• Capital Reserve Account @ 9%	$ 17,300	$ 13,100	$ 7,400
TOTAL ANNUAL COST	$1,271,200	$1,096,900	$876,800
- Annual Cost Per Ton Disposed	$13.00/T	$17.40/T	$25.00/T

APPENDIX C

REVIEW OF ENVIRONMENTAL REGULATIONS

APPENDIX C

It is the purpose of this Appendix to review the environmental regulations currently in force and/or proposed that may have an impact on the Floyd County solid waste disposal project. Any of the previously proposed disposal options must meet the minimum requirements contained in Federal and state rules, regulations and codes on land, air, water, and noise which are described below.

A. FEDERAL LEGISLATION

1. Public Law 94-580, the Resource Conservation and Recovery Act (RCRA) of 1976. - This is a research, development and demonstration act which replaces the Solid Waste Disposal Act of 1965 as amended by the Resource Recovery Act of 1970. RCRA authorizes the EPA to establish and enforce new solid waste management guidelines and includes the provision for organization of a state agency responsible for statewide solid waste management planning. It provides federal funding levels considerably higher than in recent years, though the funds for implementing solid waste management alternatives have not been appropriated. This law prohibits the use of open dumps by requiring that all land disposal of non-hazardous wastes be achieved using sanitary landfills.

   Some aspects of RCRA remain to be formulated. For example, through RCRA, the EPA is given 3½ years to propose regulations which establish standards for the control of products which are felt to consume an unreasonable amount of energy and virgin materials. This legislation would force the packaging industry to manufacture consumer containers that contain disposable material and more recyclable material.

The possible effects of these regulations are difficult to evaluate at this time, however, since certain materials in the waste stream may increase over time as other decrease. It will be necessary for the County to keep abreast of the development of RCRA programs and appropriations bills to determine how this Act will affect its solid waste plans.

2. Tax Reform Act of 1976. - This Act includes tax incentives for the use of recyclable materials. Though directed towards reform in other areas, it includes provisions which affect directly resource recovery from solid waste. The Act calls for a phased elimination of some of the economic barriers, in the form of certain depletion allowances, that stand in the way of greater utilization of recovered materials from solid wastes, and includes an amendment which gives direct tax credits to purchasers of recycled materials. In addition, an investment tax credit is also contained in this Act. Overall, it seems that this legislation will benefit the future of energy and/or materials recovery systems.

3. Solid Waste Disposal Act, as amended. - This Act is responsible for the promulgation of EPA Guidelines for the Thermal Processing of Solid Waste and EPA Guidelines for Solid Waste Storage and Collection.

4. Clean Air Act, as amended. - This Act initiates a national research and development program to achieve the prevention and control of air pollution. It provides for Federal financial assistance to states and local governments for accomplishing these objectives. By nature of this law, open burning (e.g., in a landfill) is prohibited.

5. Federal Water Pollution Control Act, as amended. - This law includes provisions for developing areawide waste treatment management planning processes which would assure adequate

control of sources of pollutants in each state, banning the discharge of toxic pollutants in toxic levels, and developing the technology necessary to eliminate pollutant discharge into navigable waters, waters of the contiguous zone, and the oceans. The later two provisions are of extreme importance in the design of sanitary landfills.

6. Occupational Safety and Health Act, as amended.

7. Noise Control Act, as amended.

8. Railroad Revitalization and Regulatory Reform Act of 1976. - This law requires the Interstate Commerce Commission (ICC) to investigate and eliminate discriminatory rail rates for transportation of recycled materials.

The State of Georgia has implemented and/or responded to the legislation in Items 3 through 7, as required.

B. STATE LEGISLATION

1. Georgia Solid Waste Management Act and Georgia Solid Waste Management Rules. - The Act is a general declaration of public policies relative to solid waste management and utilization containing provisions pertaining to permits for solid waste handling or construction or operation of a disposal facility, submittal of solid waste management plans by municipalities and counties, investigations of violations, civil penalities, and the availability of grants for construction of solid waste handling systems. The waste management rules are an expansion of the Act. They describe in detail the regulations and procedures governing the following topics:

a) Paragraphs 391-3-4-.02 and .03 -- Procedures concerning application for, issuance and revocation of permits.

b) Paragraph 391-3-4-.05 -- Procedures and requirements for municipal submittal of solid waste management plans.

c) Paragraph 391-5-4-.06 -- Sets requirement for waste collection and transportation; discusses vehicle construction and maintenance, transfer stations and hazardous waste collection.

d) Paragraph 391-3-4-.07 -- Establishes operating requirements for sanitary landfills and landfills.

e) Paragraph 391-3-4-.08 -- Establishes operating requirements for various processing operations, including incineration, pyrolysis, shredding, and reclamation and recycling.

f) Paragraph 391-3-4-.04 -- Listing of some general rules including prohibited acts (burning, scavenging, open dumps), handling of hazardous and special wastes, and site closures.

2. Georgia Air Quality Act of 1978 and Georgia Air Quality Control Rules - The purpose of the Air Quality Act is to document the policies to ensure the preservation, protection and improvement of air quality, the control of air contaminant emissions, and the attainment and maintenance of specified Ambient Air Quality Standards. Notable provisions included in this Act concern construction and operating permits for air pollution sources or facilities, inspection of facilities and investigation of existing or possible air pollution conditions, and civil and non-compliance penalties. In order to carry out the purposes and requirements of the Act, the Air Quality Rules were promulgated. Of prime importance are the regulations and procedures found in Paragraph 391-3-1-.02 (Provisions) pertinent to the following aspects of air pollution control, namely, emission standards (section 2), sampling (section 3), ambient air standards (section 4), open burning (section 5), and source monitoring (section 6). Contained in section 2 (emissions standards) are the

limitations on the emissions of particular contaminants from various types of processing operations. When considering the Rome-Floyd project specifically, the primary contaminants in question are smoke, particulates, sulfuf dioxide (SO_2) and nitrogen oxides (NO_x) for the starved air incinerator option, and fugitive dust for RDF production and landfilling:

a) smoke and particulates - except as specified in the section dealing with conical burners, no person shall cause or allow to be emitted into the open air from any incinerator constructed or extensively altered after January 1, 1972, air contaminants as follows:

   i) units with charging rates of 50 tons or less per day for types 0,1, or 2 waste: fly ash and/or other particulate matter in quantities exceeding 0.10 grains per standard dry cubic foot of flue gas, calculated to 12 percent carbon dioxide by volume for products of combustion.

   ii) smoke the opacity of which is equal to or greater than 20 percent (Ringelmann No. 1); or equal to or greater than 40 percent (Ringelmann No. 2) for three minutes in any one-half hour period.

b) SO_2 - no person shall cause, let, suffer, permit, or allow from any source the emission of sulfur dioxide (SO_2) equal to or exceeding 213.6 lbs/hr. This is based on the following formula for stack heights less than 90 ft:

$$SO_2 = 1.2(F)(hs)$$

where F = 2 for combustion sources of SO_2 below 10,000 million Btu/hr heat input, as would be this plant, and hs is stack height in feet.

c) NO_x - no person shall cause or allow from any source, except fuel burning equipment, the emission of nitrogen oxides (NO_x), expressed as nitrogen dioxide, equal to or exceeding 9207 lbs/hr. This is based on the following formula for stack heights less than 300 ft:

$$NO_x = 9{,}300\ (hs/300)^3$$

where hs is stack height in feet.

d) fugitive dust - All persons responsible for any operation, process, handling, transportation or storage facility which may result in fugitive dust shall take all resonable precautions to prevent such dust from becoming air-borne. Some reasonable precautions which could be taken to prevent dust from becoming airborne during production of RDF and sanitary landfill operation include, but are not limited to, the following:

  i) Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land;

  ii) Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials, stockpiles, and other surface which can give rise to airborne dusts;

  iii) Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials.

  iv) Covering, at all times when in motion, open bodied trucks, transporting materials likely to give rise to airborne dusts;

  v) The paving of roadways and their maintenance in a clean condition.

Section 4 (ambient air standards) describes the limitations on contaminant levels in the air at ground level and pertains to sulfur dioxide, particulates, carbon monoxide (CO), ozone (O_3), non-methane hydrocarbons, and nitrogen dioxide (NO_2).

These limitations are summarized as follows:

a) SO_2 - concentration, at ground level, shall not exceed 715 micrograms per cubic meter for a one-hour average, 229 micrograms per cubic meter for a twenty-four hour average, or 43 micrograms per cubic meter for the annual mean concentration. Standard conditions for sulfur dioxide measurements shall be considered to be 0 degrees C and 760 mm. Hg.

b) Particulates - concentration, at ground level, shall not exceed 150 micrograms per cubic meter for a twenty-four average, or 60 micrograms per cubic meter, annual geometric mean.

c) CO - concentration, at ground level, shall not exceed 40 milligrams per cubic meter for a one-hour average or 10 milligrams per cubic meter for an eight-hour average. Standard conditions for carbon monoxide measurements shall be considered to be 25 degrees C and 760 mm. Hg.

d) O_3- concentration, at ground level, shall not exceed 98 micrograms per cubic meter for a one-hour average. Standard conditions for photochemical oxidant (ozone) measurements shall be considered to be 25 degrees C and 760 mm.Hg.

e) Non-methane hydrocarbons - concentrations, at ground level, shall not exceed 98 micrograms per cubic meter for a three-hour morning average. Standard conditions for total hydrocarbons measurements shall be considered to be 25 degrees C and 760 mm.Hg.

f) NO_2 - concentration, at ground level, shall not exceed 300 micrograms per cubic meter for a 24-hour average, or 100 micrograms per cubic meter, annual arithmetric mean. Standard conditions for nitrogen dioxide measurements shall be considered to be 25 degrees C and 760 mm.Hg.

Also noteworthy are Paragraph 391-3-1-.03, which outlines the procedures concerning application for, issuance or revocation of construction and operating permits, and Paragraph 391-3-1-.07 dealing with inspections and investigations.

3. Georgia Water Quality Control Act and Georgia Water Quality Control Regulations - The Act was formulated for the establishment and maintenance of a water quantity control program to ensure the prudent use of water resources in order to restore and maintain a reasonable degree of purity in, and adequate supply of, the waters of the State. In addition, it requires, where necessary, reasonable treatment of sewage, industrial wastes and other wastes prior to their discharge into the waters of the State. The only significant water pollution threat posed by the disposal options discussed for this project would be sanitary landfill leachate. Reviewing the Act in this light reveals the following notable provisions, namely, discharge permits for point and non-point (e.g., a landfill) pollutant sources; inspections of facilities and investigation of violations; monitoring, recording and reporting of water conditions; and violations of the Act and Civil penalities. The Water Quality Regulations were instituted to carry out the purposes and requirements of the Act. Important sections of these Regulations worthy of attention are as follows:

a) Paragraph 391-3-6-.03 -- Water Use Classification and Water Use Standards - This paragraph itemizes nine specific water use classifications (section 4), outlines the specific water quality criteria for each of these classes (section 6) and general criteria for all waters (section 5). Specific criteria include bacteria levels, temperature, pH, and dissolved oxygen level.

b) Paragraph 391-3-6-.05 -- Emergency Actions - Contains procedures to be followed in the event of a water pollution emergency.

c) Paragraph 391-3-6-.06 -- Waste Treatment and Permit Requirements - This paragraph contains the background information necessary for any project where water pollution may or will occur concerning the degree of treatment required and the general procedures relating to the application for, issuance or revocation of pollutant discharge permits. In addition it documents the requirements for monitoring, recording, and reporting pollutant discharge (section 11), and the control of pollutant disposal into wells or subsurface water (section 14). The latter item is particularly important when considering the sanitary landfill option.